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Springfield, Mass., Station "WBZ"	**360 Meters**
Chicago, Ill., Station "KYW"	**360 Meters**

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EAST PITTSBURGH, PA.

Westinghouse

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Owing to the fact that certain statements and expressions of opinion from correspondents and others appearing in these columns from time to time may be found to be the subject of controversy in scientific circles and in the courts, either now or in the future, and to sometimes involve questions of priority of invention and the comparative merits of apparatus employed in wireless signalling, the owners and publishers of this magazine positively and emphatically disclaim any privity or responsibility for any statements of opinion or partisan expressions if such should at any time appear herein.
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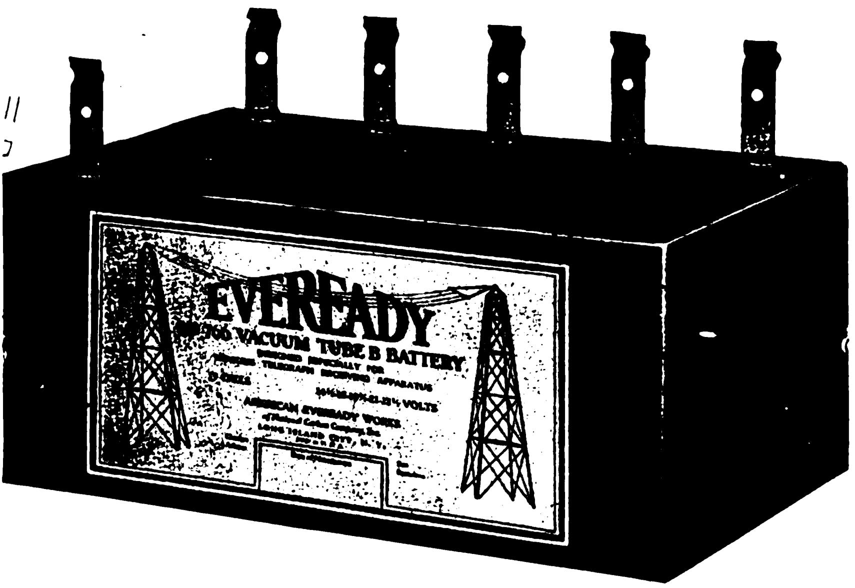

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A-25-TE

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Duplicate the Set
Heard Across the Atlantic

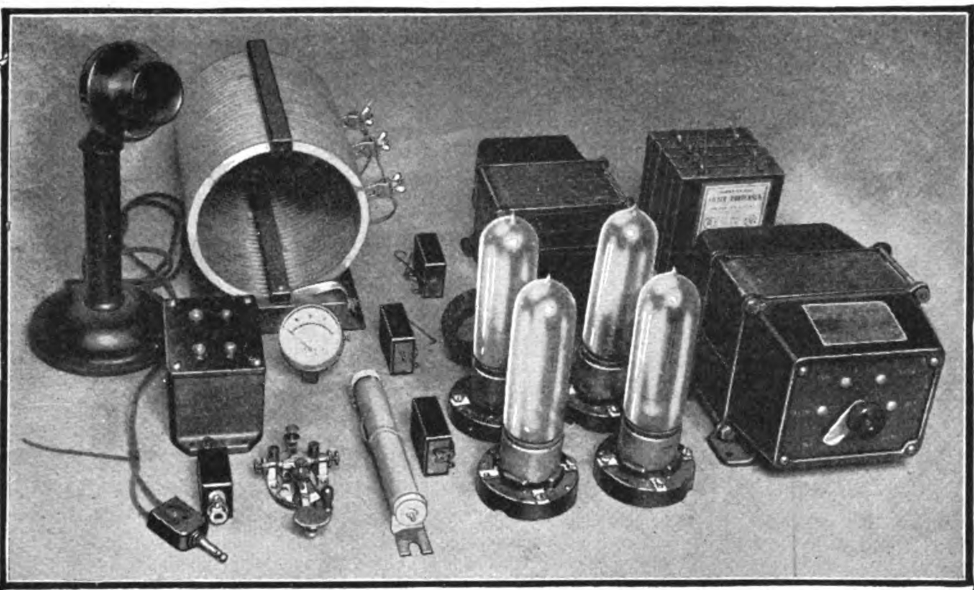
Amateur history was made on December 9, when 1-BCG in Greenwich, Conn., was heard in Ardrossan, Scotland—a distance of over 3500 miles.

This amazing feat was performed with four Radiotrons UV-204—one used as a master oscillator, the other three as amplifiers.

There was nothing special about 1-BCG's equipment. His circuit was similar to those described and illustrated in the RCA Catalogue for CW transmission.

You can duplicate the equipment used at 1-BCG for experimental communications at a comparatively small expense.

Look over the RCA Catalogue and Instruction Book. Select the set most suitable for your needs, and then order the required parts from your nearest dealer.



100 Watt Radio Telephone Transmitter

Microphone and Stand	$15.00
Jack ($1), Plug ($2), Cord ($1.50)	4.50
Oscillation Transformer UL-1008	11.00
Magnetic Modulator UT-1367	17.00
Antenna Ammeter UM-533	6.25
Sending Key UQ-809	3.00
Transmitter Grid Leak UP-1718	$ 1.65
Transmitter Condensers UC-1015	5.40
Transmitter Condensers (2) UC-1014	4.00
Filter Reactor UP-1627	15.75
Radio Frequency Choke	2.00
Radiotron Power Tubes UV-203 (2)	60.00
Kenotron Rectifier Tubes UV-217 (2)	$53.00
Filter Condensers (5) UC-1635	10.00
Power Transformer UP-1016	38.50
Incidentals	12.95
Approximate total	$260.00

For complete circuit and details of necessary apparatus to make up this radio telephone set see Fig. 1, page 11, RCA Catalogue, which can be secured from your nearest dealer or by sending 25 cents direct to

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Radio Corporation of America

WORLD WIDE WIRELESS

233 Broadway, New York City

With one Radiotron They heard him in Scotland

On the night of December 10, 1-RU at Hartford, Conn., was heard by Paul Godley, official observer of the Transatlantic Radio Tests at Ardrossan, Scotland.

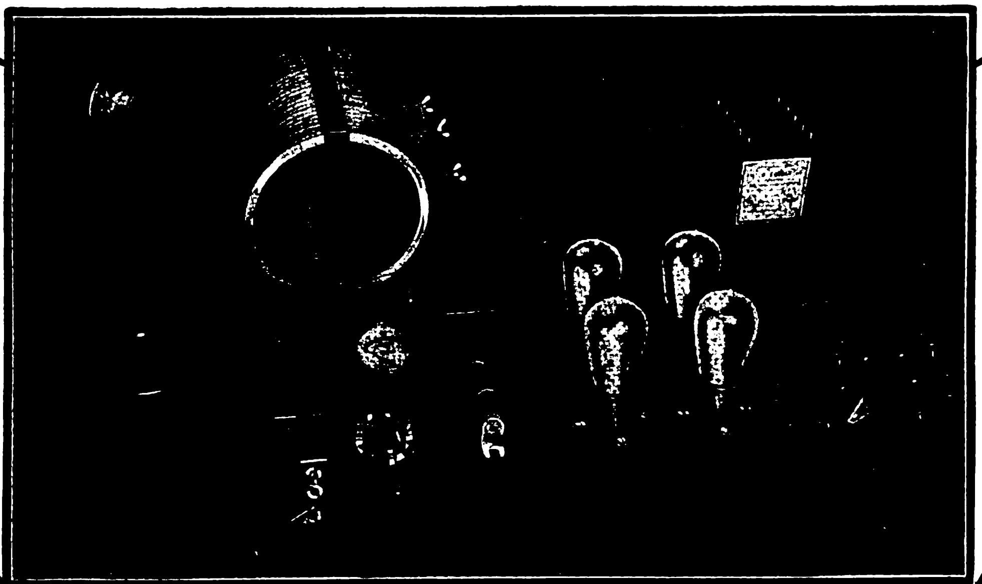
The feat was striking for this reason:

The transmitter of 1-RU for CW transmission included only *one* Radiotron UV-203.

WITH ONE 50-WATT TUBE 1-RU WAS HEARD IN SCOTLAND.

CW transmission gives the amateur the range he wants. Radiotrons enable him to telephone over great distances with RCA equipment that can be bought from dealers at comparatively little expense.

Study the picture of the outfit shown on this and the preceding page. Also look over the RCA Catalogue and Instruction Book. Then order from your dealer.



10 Watt Radio Telephone Transmitter

Microphone and Stand	$15.00	Transmitter Grid Leak UP-1719	$ 1.10	Kenotron Rectifier Tubes UV-216(2)	$15.00
Jack, plug and cord 1.00, 2.00, 1.50	4.50	Transmitter Condensers UC-1015	5.40	Filter Condensers (5) UC-1632	9.25
Oscillation Transformer UL-1008	11.00	" " (2) UC-1014	4.00	Power Transformer UP-1368	25.00
Magnetic Modulator UT-1643	9.50	Filter Reactor UP-1626	11.50	Incidentals	11.75
Antenna Ammeter UM-530	6.00	Radio Frequency Choke Coil	2.00		
Sending Key UQ-809	3.00	Radiotron Power Tubes UV-202 (2)	16.00	Approximate cost	$150.00

For complete circuit and details of necessary apparatus to make up this radio telephone set see Fig. 1, page 11, RCA Catalogue which can be secured from your nearest dealer or by sending 25 cents dirct to

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No. P-I Gen. Radio, semi-mtd.	5.00

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DL-100	.......1.55	DL-750	.......2.35
DL-150	.......1.60	DL-1000	......2.60
DL-200	.......1.65	DL-1250	......3.00
DL-250	.......1.70	DL-1500	......3.50

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No. UC-568	"	"	.0005	MF.	1.35
No. UC-567	"	"	.00025	MF.	1.20
No. UX-543	"	"	Cond.	mtg.	0.50

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(for "A" Batteries)

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No. P-3 FF Battery Booster, 5 amp. type	16.00

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No. CR-5 Grebe 175-3000 meters, "Super-Special" complete set	80.00
No. CR-8 Grebe 175-1000 meters, complete set, latest "Relay special" ..	80.00
No. CR-9 Grebe 175-3000 meters, complete set with det. and 2 stage amplifier, self contained, "A Masterpiece"	130.00
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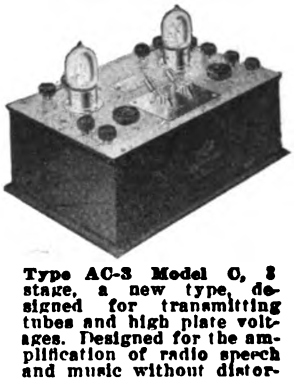

Type AC-3 Model C, 3 stage, a new type, designed for transmitting tubes and high plate voltages. Designed for the amplification of radio speech and music without distortion, and will give maximum output to energize your MAGNAVOX, or in fact any type of receiver. Master stage to stage switching, mahogany case, sits flat or on edge—$110. AC-2 Model C, 2 stage (Illustrated) Exactly as the three stage except two stages, same quality and design throughout—$80.

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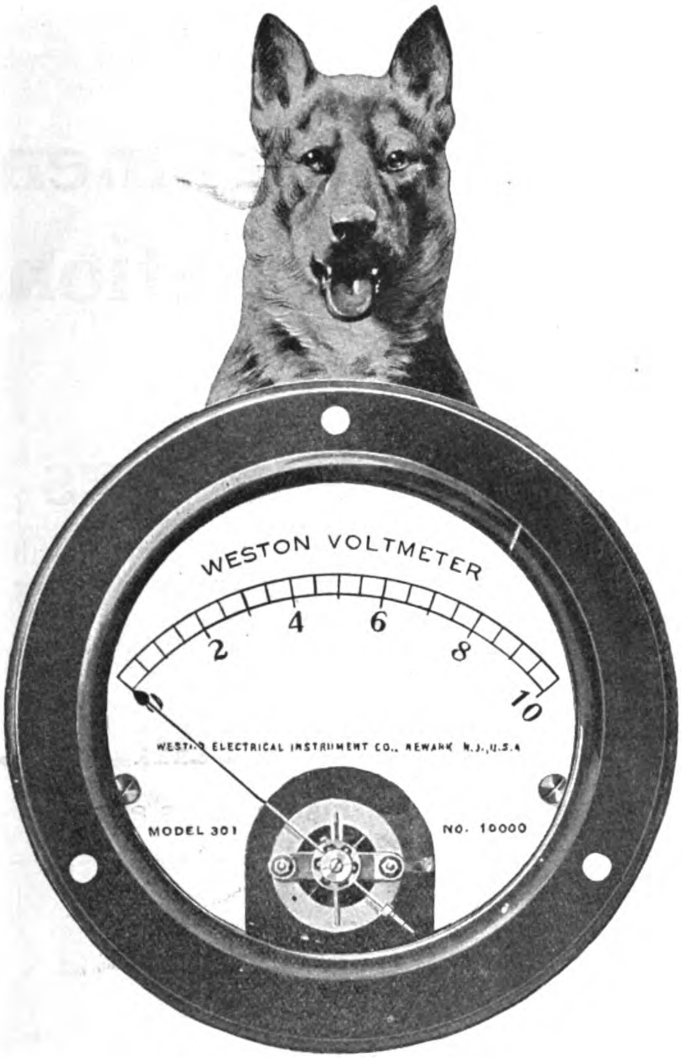

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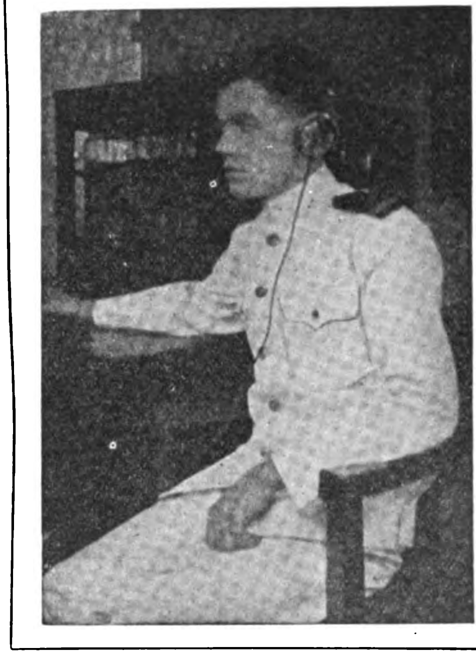

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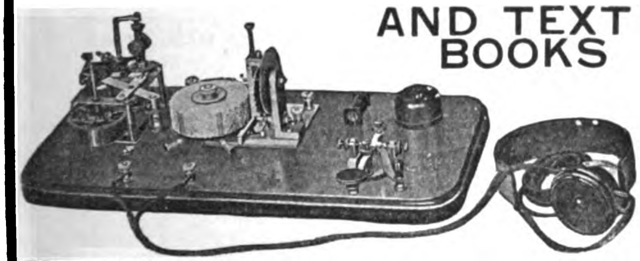

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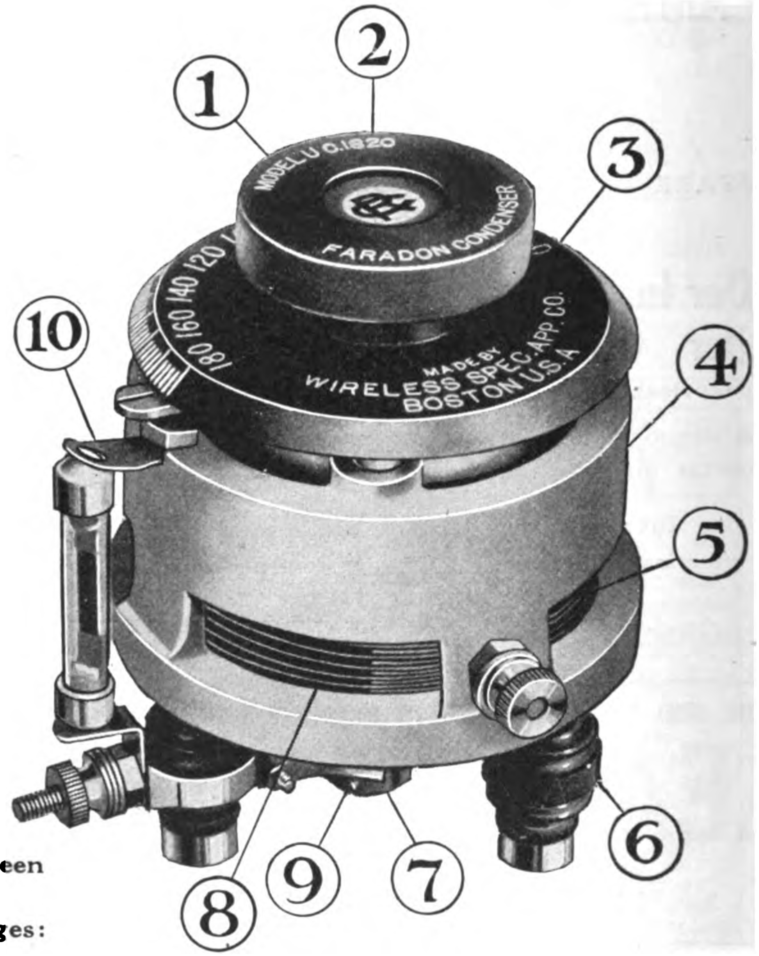

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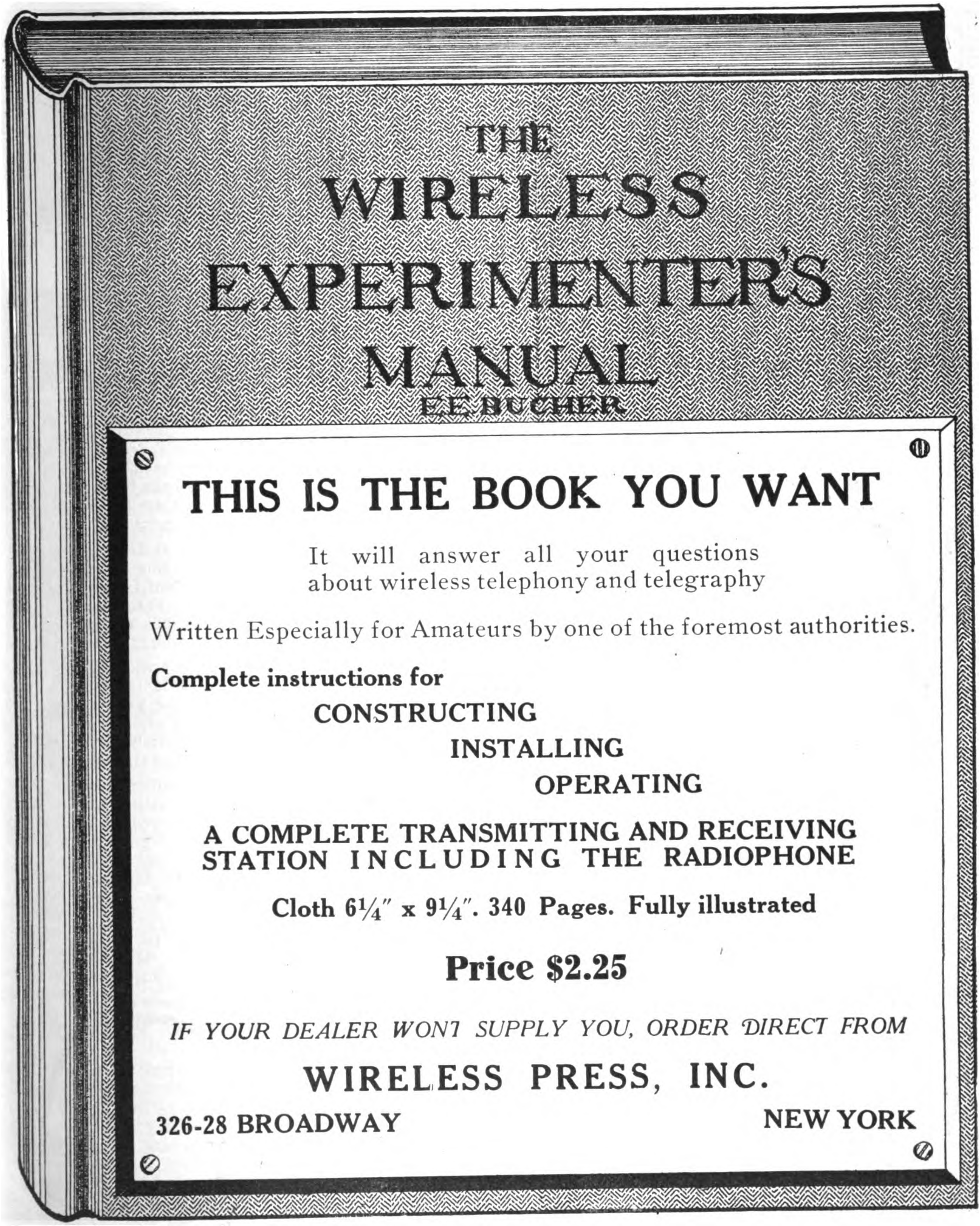

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VOL. 9. No. 5 FEBRUARY, 1922

WI[illegible]AGE

WORLD WIDE WIRELESS

International Radio Station in Brazil

ANNOUNCEMENT that plans have been completed for an international radio central at Rio de Janeiro, Brazil, which will be modelled upon the plans of the big American radio station on Long Island, was made by E. F. W. Alexanderson, wireless expert for the General Electric Company and Chief Engineer of the Radio Corporation of America.

Mr. Alexanderson, who has just returned from a conference with radio engineers from the United States, Britain, France and Germany, said the monster station would be constructed by the International Radio Company and that a sub-station would be built at Para.

✦ ✦ ✦

Goldsmith Comments on Amateur Transatlantic Achievement

PROFESSOR Alfred N. Goldsmith, head of the radio and electrical departments of the College of the City of New York, commented on the success of the six wireless amateurs at Greenwich, Conn., who succeeded in transmitting a message to Ardrossan, Scotland, spanning the Atlantic with the feeble power and short wave length to which amateurs are restricted by law.

"This feat has aroused the keenest interest among the 100,000 or more wireless enthusiasts in this country," said Professor Goldsmith.

"If the British radio regulations for amateurs were no stricter than those of the United States, the boys in England might accomplish similar feats.

"Due to the strict British laws, however, the British amateurs are confined at present to reception only, and the sending must be done from this side."

Prof. Goldsmith compared the picking up of the feeble signals in Scotland to the perception by eyesight of the rays of an ordinary electric bulb at a distance of 3,000 miles. This, he asserted, would give an intimation of the extraordinary sensitiveness of the receiving instruments which picked up the amateur signals abroad.

"The power used by the wireless amateurs in transmission is not much more than that used by a large electric bulb," he said. "The only difference is that the light rays are visible to the human eye, while the radio energy is not and must be recorded by electrical instruments which convert them into sounds that may be recognized by the human ear."

Radio Warns of Volcanic Eruption in Mexico

WIRELESS warnings relayed from the City of Mexico to Point Isabel picked up at a local National Guard radio station, stated that Popocatel was in violent eruption, and all towns in the vicinity of the volcano were warned that the eruptions were the most serious of any since the volcano suddenly started.

Surgeon-General Hugh S. Cumming of the United States Health Service inaugurating the radiophone health bulletin service which is broadcasted twice a week from Washington

Radio Call Brings Doctor by Airplane

A PHYSICIAN at the Naval Air Station went by airplane from Norfolk to Hatteras, N. C., 130 miles, to take medical aid to the wife of a naval radio operator at the North Carolina station.

Hatteras is two hours from Norfolk by air, but it is three days from here by overland route. The naval radio station there has no physician, but a hospital man gives such medical attention as he can.

He sent a wireless message for a doctor, reporting that the wife of one of the operators was seriously ill. Lieutenant L. B. Stump left the Norfolk air station, carrying Dr. Angel as a passenger. The doctor found the patient suffering from pneumonia, for which he prescribed and gave instruction as to treatment.

Radio Station North of the Arctic Circle

A WIRELESS station has been established on an Arctic island, according to "The Daily News." The intrepid party of scientists who set out to establish a wireless observatory on the lonely island of Jan Meyen, in the North Atlantic, 300 miles north of the Arctic Circle, have now erected their wireless station and are sending out daily reports of the weather.

The party consists of a group of Cambridge naturalists, a representative of the Norwegian Weather Service, the secretary of the International Glacier Commission and a German wireless operator. They left Bergen, Norway, in two boats laden with wood for huts, a complete wireless installation, and oil fuel to work it, and a set of meteorological instruments.

No one has before stayed long on this cold island, the average temperature of which throughout the year is below the freezing point, but during the last century a rough map of the island, showing a glacier-covered mountain at one end, a fresh-water lake and several tiny harbors, was drawn by an Austrian explorer.

The object of the reports is to give warning of storms sweeping toward Europe from the polar regions to fishermen and shipping generally.

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Radiophones on Paris Trains

WIRELESS telephone conversations between trains moving at the rate of forty miles an hour and the Paris central station, which have been achieved in the last few days, hold out a promise of greater safety for passengers, as well as a considerable diminution of intermediate signaling stations.

Antenna constructed on top of an ordinary coach were in constant communication with other antenna between two telegraph poles midway of the experimental area and enabled the use of telegraph wires to carry the messages to the receiving point. The voice of a train conductor could be heard clearly over a distance of fifty miles by the receiving station in Paris as the train passed each station or railroad siding.

The Nord companies are extending the experiments as far as Calais. Wireless signaling from Paris as far as Rouen has been in use for several months and with complete satisfaction. Meanwhile the State lines are considering the elimination of obsolete telephonic dispatching.

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Radiophone Studio Destroyed

THE Broadcasting Studio of the Westinghouse Radio station in Newark, N. J., was destroyed by fire on the night of January 17. It was caused by a flashlight discharge. The fire occurred at the close of a special performance and for a time endangered the lives of several hundred people who had attended the concert.

At the close of the performance, which featured Ida Geer Wheeler, soloist, and Edna Rockwell, accompanist, a photographer sought to take a flashlight photograph of the principals. They consented and took positions near the screen. When the flashlight was discharged burning specks of powder flew in all directions and set the screen on fire. The performers narrowly escaped.

In less than a minute the entire screen was aflame and the crowd, which was leaving the studio, began to fight for exits. A general alarm was sounded and the company's fire department reported. In a short time they succeeded in getting the fire under control before it spread beyond the studio. Valuable Vocalion records and two pianos were destroyed.

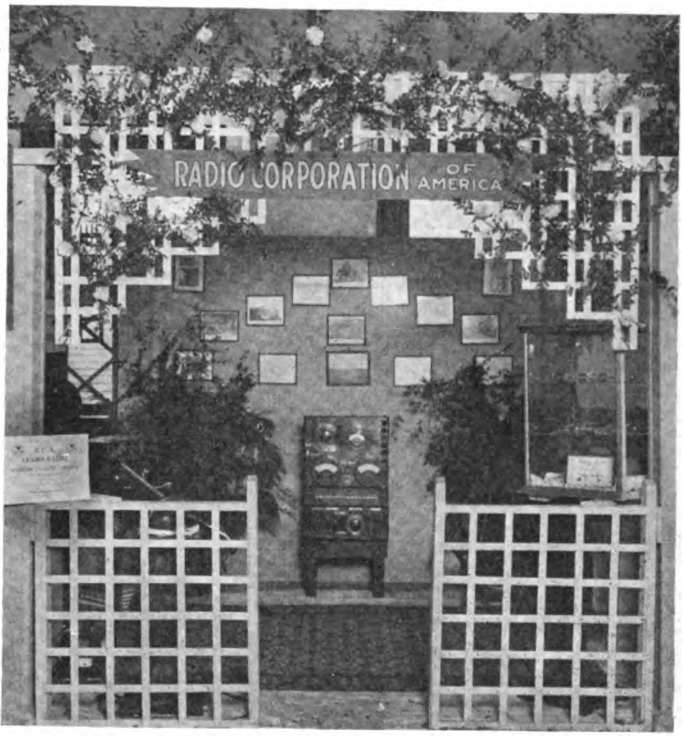
The damage was estimated at $7,000.

✦ ✦ ✦

International Radio Congress Planned

A PROPOSAL for a congress of French, Belgian, English and American radiologists which would be held next year in Paris, was put before Radiological Society of North America, at its meeting in Chicago, Ill. Dr. A. E. Barclay of Manchester, England, suggested the international meeting.

The proposal has met with favor from the members and plans for formal action toward its realization are being launched.



An interesting exhibit at the Radio Convention held in San Francisco. In the case at the right a Marconi coherer and a modern radiophone were exhibited showing the old and the new methods of radio reception. On a table behind the show case was shown a Marconi magnetic detector and an old-time tuner equipped with a crystal detector in striking contrast to the present day highly efficient vacuum tube receiver units

✦ ✦ ✦

Berlin "Lightning Wireless" Service

"LIGHTNING wireless service" was inaugurated recently between Berlin and Hamburg. Technically termed "Blitzfunk," or "lightning spark," the dispatches are to take precedence at a tenfold rate over all other wireless traffic, and the personnel has orders to speed up the lightning service.

The first message was filed in the main telegraph office at Berlin at 9 o'clock in the morning, transmitted at 9.03, receipt acknowledged at 9.05, and telephoned to addressee at 9.10.

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Army Gives Up Wire for Radio

AS a means of economy the United States Army is communicating most of its messages between stations by radio instead of telegraph, it has been announced at Second Corps Headquarters, Governor's Island, New York.

The radio messages are sent and received by soldier operators of the Signal Corps, and as this organization is plentifully equipped with radio sets, the hundreds of messages necessary to the administration of the army now cost the government nothing except the time of the soldiers involved and the slight costs of operation.

Radiograms are sent daily from every army headquarters to posts and stations in the vicinity which are equipped to receive the messages. Second Corps area, for example, is in daily communication by radio with Puerto Rico and with the forts and stations adjacent to New York. The latest post to be equipped with radio has been the U. S. Military Academy at West Point.

In order to keep a supply of trained operators on hand for the administration of the radio stations the U. S. Army General Recruiting Service is now recruiting young men who will be trained as radio operators and put to work handling the new system.

✦ ✦ ✦

Private Radio Stations in France

EVERY French manufacturer can now have a private wireless telephone system connecting his factories with the central office in Paris, thanks to the decision of the French Ministry to commercialize the recent wireless successes.

Whether this will be followed by general permission to install wireless telegraph apparatus on tops of Paris buildings on the payment of a substantial fee remains doubtful. It is evident, however, that the Government will not let anything stand in the way of obtaining new revenues, and as there is no longer any need for French censorship of either incoming or outgoing messages it is suggested that the time is not far distant when Paris correspondents will have direct communication with their newspapers across the Atlantic, each with a special calling signal and wave length assigned to him by the French Government.

The cost of maintaining land wires here is understood to have delayed the general use of the telephone, and, indeed, it is rarely that one finds a telephone in a private residence outside of Paris. But the extension of the wireless system promises to change all this. The Government is willing to rent the wireless apparatus at a rate of only $25 a year a mile of communication involved and an additional $2 a year a mile to cover all expenses of repair and the maintenance of communication free from the interference of other wireless users. This is ridiculously cheap when the cost of installation of an ordinary telephone in a private home or office today is almost $100, with a yearly subscription, as the French call it, of $70.

Of course the Government's offer does not apply except in connecting up two stations, but business men are confident that once the ground is broken it will develop into an auxiliary system that will grow so rapidly as to oust the present inefficient organization.

✦ ✦ ✦

German Radio Plant in Argentina

A NEW powerful German wireless station has been constructed at Monte Grande, in the Province of Buenos Ayres, and successfully tested. Messages were received from stations 15,000 kilometres distant in the course of the tests. A code message being transmitted from San Francisco to Tokyo was picked up.

The station has been installed over an area of 569 hectares (approximately 1,400 acres). When completed, it will consist of six big towers, each of which is to be 210 metres high (approximately 630 feet). It is asserted that the station will be able to communicate with points all over the world. Service is to be started about the middle of next year for receiving, and in February, 1923, for sending.

✦ ✦ ✦

Isle of Yap Radio Regulations

UNDER the treaty, or convention, between the United States and Japan relating to the Island of Yap and the mandated islands of the Pacific, over which Japan has the mandate, the United States secures the rights of cable and wireless privileges, for which it has contended since the treaty of Versailles was drawn up. Japan retains the administrative control over the island.

The Yap cable and wireless rights are given by the new treaty to the American and Japanese governments and their nationals alike, on terms of equality. These rights are regarded as particularly important because of the position of Yap, in the center of the Pacific group to the south of Japan.

✦ ✦ ✦

Radio Relieves Distress at Sea

A WIRELESS dispatch received at Queenstown, Ireland, reported that a fire on board the Dutch freight steamship Sommelsdyk, which during the day had caused the vessel to send out calls for aid, had been extinguished and the vessel was proceeding on her voyage to Rotterdam.

The Sommelsdyk, which is a freighter, left Baltimore December 20, and after touching at Newport News, proceeded for Rotterdam.

Wireless messages received at Boston reported the United States Shipping Board steamer Mount Evans in distress 600 miles east of Boston. The vessel was without fuel oil the radios said.

Charlestown Navy Yard officials expressed the belief that the vessel had been taken in tow, but had as yet received no word to that effect.

The Mount Evans was bound from Antwerp to New York with a valuable cargo. She carries a crew of fifty officers and men.

A radio message sent to the United States Line offices, New York City, by Captain A. B. Randall of the steamship Hudson reported the rescue of six members of the crew of the French schooner Reine des Mers in a heavy storm after the captain had been washed overboard. The schooner was laden with salt cod and ling fish from St. Pierre and Miquelon, whence she sailed on December 27 for Bordeaux. The rescued seamen landed in New York aboard the Hudson.

Modern fire fighting service requires the use of radio apparatus as evidenced by the installation at headquarters of the Cambridge, Mass., Fire Department

✦ ✦ ✦

MacMillan in the Arctic Greeted by Radio

DONALD B. MacMILLAN, the arctic explorer, supposed to be frozen in at his winter base 1500 miles north of Boston, off the West Coast of Baffin Land, has been given a life membership in the Theta Delta Chi, Founders' Corporation. Through the co-operation of the Carnegie Institution of Washington and the courtesy of the director of Naval Communications of the United States Navy Department, a wireless message was sent to Dr. MacMillan, apprizing him of the gift.

Radiophone Broadcasting Station WDY

General Description of Station, Transmitting Set, Antenna Installation and Artists' Studio

THE radiophone broadcasting station of the Radio Corporation of America at Roselle Park, New Jersey, call letters WDY, has been in operation every week day night since December 15th. During the time the station has been in operation several thousand letters have been received requesting information as to the details of the station, the type of set used, the size of the antenna and everything else that can be imagined to be of interest to the thousands of listeners who have enjoyed the informal programs broadcasted by this station.

While nothing would give more pleasure than the writing of a personal reply to all of these letters, this of course, has been impossible and this article is therefore written with the idea of covering the inquiries contained in the large number of letters received.

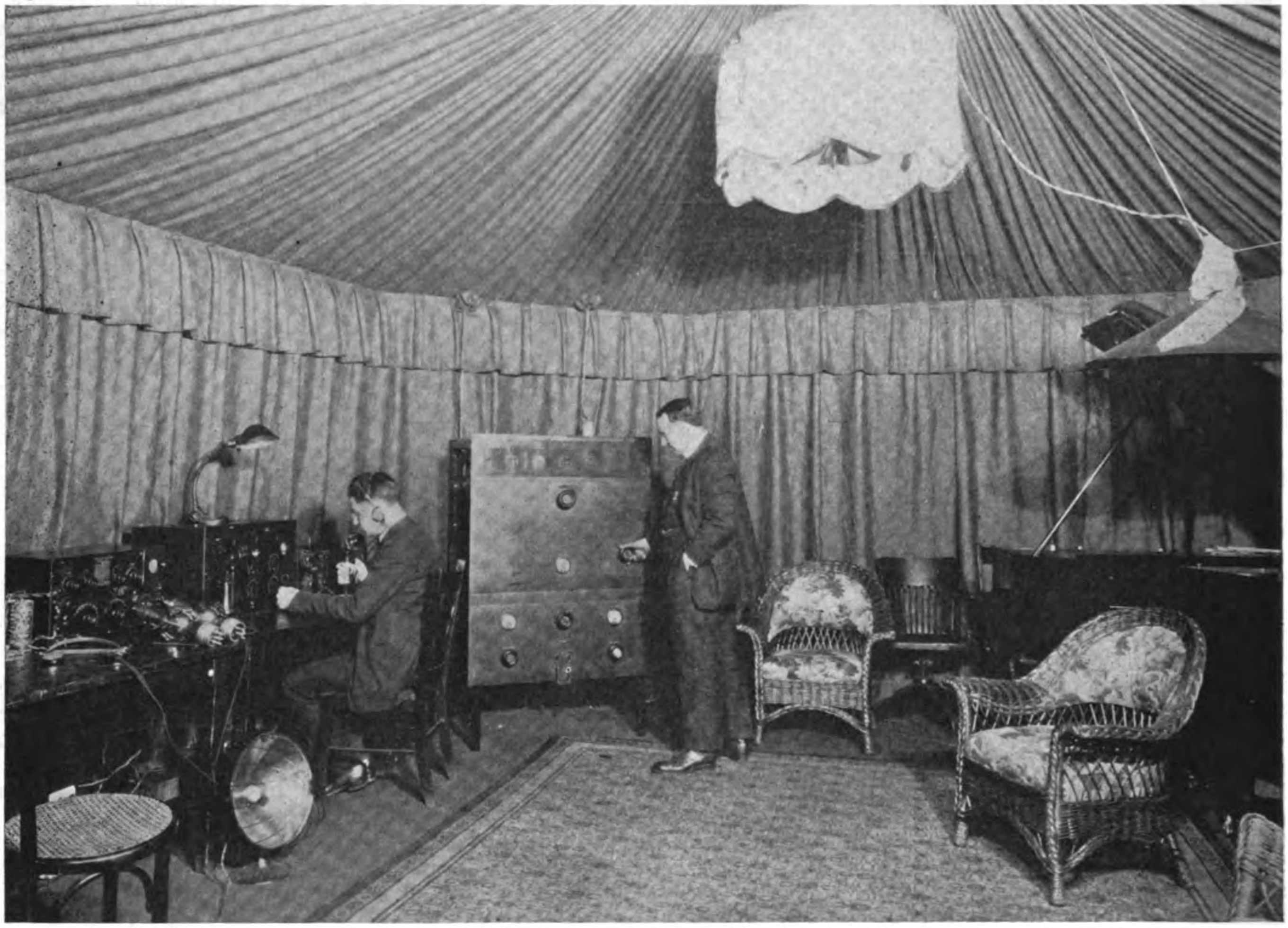
WDY station is located in the General Electric Company's plant, formerly the old Marconi plant in the Aldene section of Roselle Park, New Jersey. It is about sixteen miles due west from New York City, in the central part of the state of New Jersey.

Two steel lattice towers each 175 feet high and 20 feet square at the base support a six wire cage type antenna 10 inches in diameter. These towers are 200 feet apart. The antenna is of the multiple-tuned type and has two cage leads, one of which is connected to the center of the horizontal part of the antenna, being connected through a tuning coil to ground. The other lead which is connected to one end of the horizontal portion of the antenna leads down to the set in the station. Both of these leads are of cage type, 4 inches in diameter. This multiple tuning of the antenna gives much greater efficiency on the short wave of 360 meters than would be true of any other type of antenna arrangement. The antenna current of the station is between 8 and 10 amperes,

The power for the station is furnished by the Public Service Corporation of New Jersey and goes into the power room at 2200 volts, 2 phase. This alternating current is used to drive the A. C.-D. C. motor-generator from which current for the D. C. motor-generator of the set itself is secured. An auxiliary A. C.-D. C. set is also installed and this draws power direct from the A. C. supply.

The radio set is of General Electric Company manufacture. The filaments of all tubes are lighted with A. C. which is supplied from a special winding on the radio motor-generator set.

The voltage of the generator which supplies the plate potential for the large tubes used in the set is 2,000 D. C. Four 250 watt radiotrons UV-204 are used in the set itself, two as power tubes, or oscillators, and two as modulators. A 50 watt tube is used as a speech amplifier in connection with a system of 5 watt tubes used as modulation amplifiers, the latter in turn receiving their energy



Studio of WDY Station. On the operating table at the left are located the receiving equipment of the station and all controls of the transmitting set

from several microphones of special type placed about the room at desirable points. By means of a set of resistances in the modulation amplifier circuit it is possible to regulate voice and music modulation to any degree desired.

WDY is really not a radio station—it is a studio. It is of hexagonal shape furnished in blue and gold draperies; the carpets and rugs carry out the same color scheme. This color scheme is also carried further in the lighting arrangements, a large chandelier in the center of the studio giving a soft, mellow light to the whole place.

By referring to the illustration it will be seen that on one side of the studio is a Knabe-Ampico piano which is used for piano selections and accompaniments. On the other side will be seen an Edison re-creation phonograph.

The radio set used at WDY shows up clearly in the illustration.

An interesting feature of the station is a large map of the United States which hangs in the foyer of the studio. Tacks have been placed on this map on points from which reports of the reception of the music and speech from the station have been reported and examination of this map shows that the extreme range of the station extends from points in Eastern Canada to Porto Rico, Cuba and Florida Peninsula and as far west as Omaha, Nebraska.

The staff of the station consists of J. Andrew White, editor of The Wireless Age, who is in charge of all programs. On opera nights Mr. White takes entire charge and handles the descriptive part of the programs which are regularly broadcasted from this station. J. O. Smith is in charge of the operation of the station and does all of the regular announcing. R. H. Ranger and E. V. Amy are the radio engineers of the station.

The character of the programs broadcasted from WDY have been different from any others heretofore broadcasted and have created an untold amount of interest and enthusiasm on the part of listeners throughout the territory covered by the station. These programs will continue, as in the past, and it is planned to broadcast a high grade form of entertainment from the station in the future.

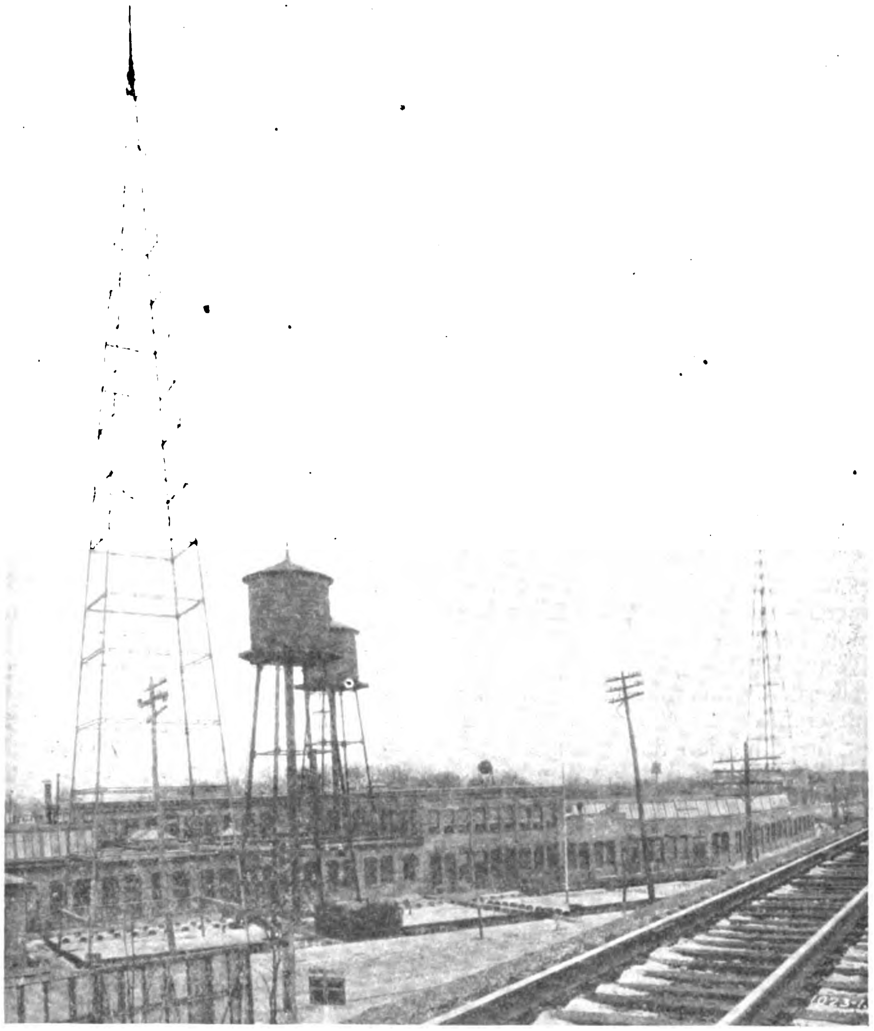
Until further notice WDY will be operated on Monday, Wednesday and Friday nights, WJZ station of the Westinghouse Company working the other four nights of the week.

Occasionally there will be talks by well-known people on popular subjects, beginning at approximately 7 p. m. Regular hour of operation will be from 8 to 10 p. m. WDY will hereafter broadcast time signals at 10 p. m. and official weather reports immediately afterward on the nights on which it is operated.

As a general rule, the Monday night programs will consist of vocal and instrumental selections by well known artists of the operatic, concert and vaudeville stage.

Wednesday night will be opera night, when interpretative performances of the popular operas will be given.

Friday nights will be the regular "party" nights, when those informal parties so well known and liked by the general public will be held.



Towers and multiple tuned antenna at WDY Station, Roselle Park, New Jersey

The number of letters received by the Radio Corporation with reference to the programs of WDY has been so great that it has been physically impossible to reply to them individually. The fact that it was not possible to reply to all such letters individually might appear to some of those who so kindly responded to the request for criticism of the programs that their letters had not been appreciated. As a matter of fact, however, all such letters have been greatly appreciated and they have all been given proper consideration in planning programs for the future. In fact, whether or not they realize it; the writers of these letters have really been the means of determining future policies of broadcasting, insofar as type of entertainment is concerned.

For many of the singers and players who have entertained great radio audiences from WDY, by radio, for the first time, the event was not only an unusual undertaking but really an ordeal. They could visualize the great audience, all right, but could not, of course, know whether or not they were pleasing that audience. These artists are making it possible to send the best in entertainment into the homes in the city, the suburbs, towns, villages, hamlets, and, even on isolated farms, and the great unseen audience whom they entertain can expect to have this music, speech and entertainment sent into the home, if it continues to show its appreciation in the future as it has in the past, by letters. If there is no appreciation, there will be very little incentive to artists to entertain. Talented artists will be interested in entertaining the public via radio in the proportion that the great radio public responds in appreciation of their efforts.

The UV-217 Kenotron—Its Operation and Application

By W. R. G. Baker

Radio Engineer, General Electric Company

IN a preceding article we considered the operation and application of the Kenotron UV-216. This device was considered in particular as a means of supplying high voltage direct current to radiotrons UV-202. It is now proposed to continue our consideration of Kenotrons, and particularly the application of model UV-217, as a source of high voltage direct current supply for Radiotron UV-203.

Kenotron UV-217 has an overall height of approximately 7½ inches and a maximum diameter of 2 inches. The plate (anode) is of sheet molybdenum about 5 mils thick, which is formed into an oval box 1¼ inches high and 1¼ inches wide. The distance between the parallel sides of the box is about ⅜ inches. The "W" shaped filament (cathode) is of ductile tungsten wire about 10 mils in diameter and 3⅞ inches long. The glass container is of special heat resisting glass. These elements are clearly shown in figure 1. The complete Kenotron is illustrated in figure 2 and the UV-203 Radiotron in figure 3.

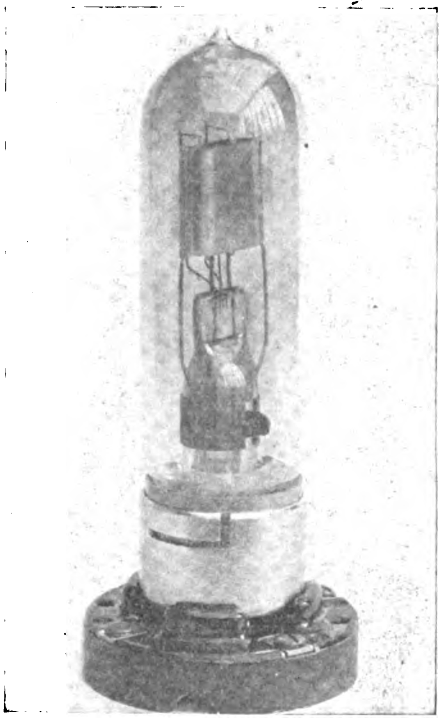


Figure 2—UV-217 Kenotron mounted in socket

As with Kenotron UV-216 the first characteristic to be considered is the relation between the filament current (or volts) and the plate current. This characteristic is obtained by using the circuit connections shown in figure 4 under the condition that the plate potential is maintained at a value sufficiently great to withdraw to the plate all the electrons emitted by the filament. The saturation current characteristic is shown in figure 5. This characteristic, as we have found, depends upon the emission of electrons from the heated filament. In general the factors regulating the rate of emission from the filament are:

1. Area of filament.
2. Filament temperature.
3. Filament material.
4. Nature of gas if any is present.
5. Pressure of gas.

The relation between the saturation current can be expressed by the equation:

$$i = A \sqrt{T\epsilon - \frac{b}{T}}$$

where "A" and "b" depend upon the filament material. "T" is the absolute temperature (degrees centigrade — 273) and "i" the saturation current per unit of filament area. When the filament is of tungsten and a perfect vacuum is assumed the value of "A" is 23.6 x 10^9 and "b" is 52,500, in which case "i" is expressed in milliamperes per square centimeter. As a comparison, the value of "A" for molybdenum has been found to be about 21.0 x 10^9 and "b" about 50,000. One ampere represents a passage of 6.28 x 10^{18} electrons per second. In the type of Kenotron illustrated by the UV-217 factors, Nos. 4 and 5 do not have any appreciable effect due to the high degree of evacuation.

The I_p — E_p and I_p — E_f or the volt ampere characteristics are obtained as with the UV-216 and are shown in figures 6 and 7. Figure 6 illustrates the limitation of current due to the temperature, that is, with a given filament voltage the current between the filament and plate increases with increased values of E_p until I_p equals the saturation current at that filament temperature. Theoretically any further increase in plate potential should result in no further increases in I_p. It will be noted that the plate current does continue to increase slightly and this apparent discrepancy will be considered later.

Figure 7 shows the effect of the space charge in limiting the electron current. An inspection of these curves shows that as the temperature (E_f) of the filament is increased I_p at first

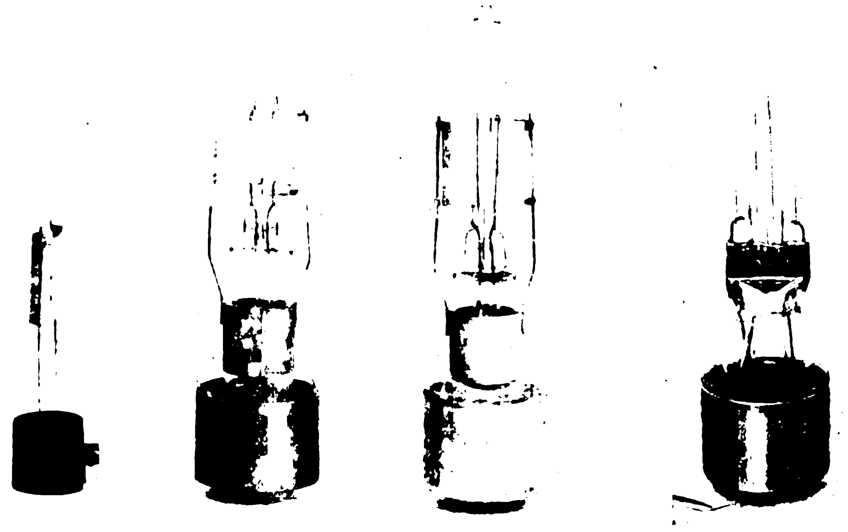


Figure 1—UV-217 Kenotron having a rated D. C. output of 150 watts at 1000 volts. Center view has one-half of plate cut away to show the filament

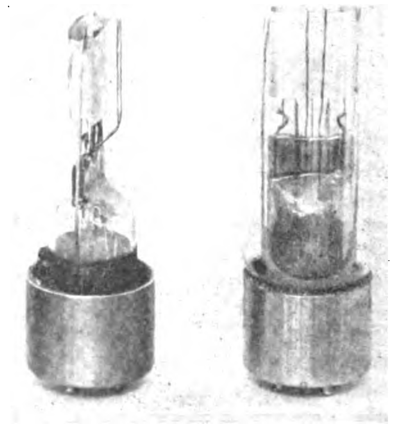


Figure 3—Model UV-203 Radiotron

increases and then tends to become constant. Also that the temperature (filament voltage) at which the plate current becomes limited is increased as the plate voltage is increased. This limiting effect is due to the electrostatic field produced by the electrons emitted from the filament. The effect of this field is to repel the movement of electrons from the filament to the plate. When the plate voltage (E_p) is increased, the strength of this field is reduced, since some of the electrons that established the repelling effect, are drawn to the plate. We find, therefore, that the electron current is limited not only by the temperature of the filament, but also by the space charge effect.

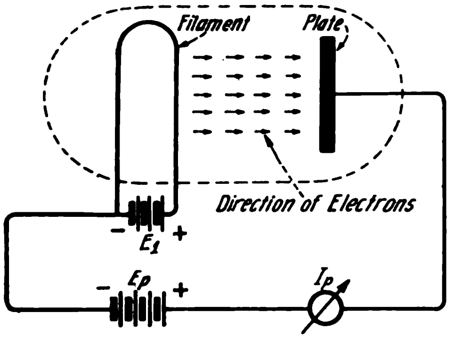


Figure 4—Circuit to determine relation between filament and plate currents

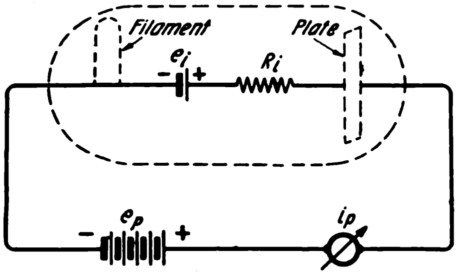


Figure 10—Circuit arranged with space charge effect equal to a counter-electromotive force

In comparing the characteristic curves of the UV-216 and UV-217 Kenotrons we see that the curves, while quite similar, differ to some extent. It is, therefore, desirable to consider the cause and effect of the shape of the characteristic curves. It is assumed that the reader of this article has read the previous article on Kenotron UV-216.

The principal factors effecting the shape of the characteristic curve of the Kenotron are—

1. Space charge.
2. Velocity of the electrons.
3. Voltage drop through the filament.
4. Electron emission.

In order to obtain a physical conception of the space charge effect on the characteristic curve, let us consider the distribution of potential between the filament and plate of a Kenotron. We shall assume that the filament and plate are equi-potential surfaces of infinite area and that the electrons emerge from the filament with zero velocity.

Considering the circuit conditions shown in figure 4, if we reduce the temperature of the filament until no electrons are emitted and plot a curve showing the drop of potential through the tube, we have the straight line as shown in curve 1, figure 8. If now we increase the temperature of the filament by increasing the filament voltage the potential distribution between the filament and plate is modified. The electrons emitted may be considered to produce a negative potential throughout a portion of the space between the filament and plate, and especially in the neighborhood of the filament. Now if in the section 0 to 1 the negative potential due to the electrons was just sufficient to balance the positive potential due to the applied voltage, it is evident that the resultant of these two opposing potentials must be zero, so that the curve coincides with the horizontal line, as shown in curve 2. This same effect occurs in section 1 to 2 but to a lesser degree, with the result that curve 2 while slightly depressed begins to rise. The effect of any further increase in filament temperature would be to depress a portion of the curve below the line of zero potential.

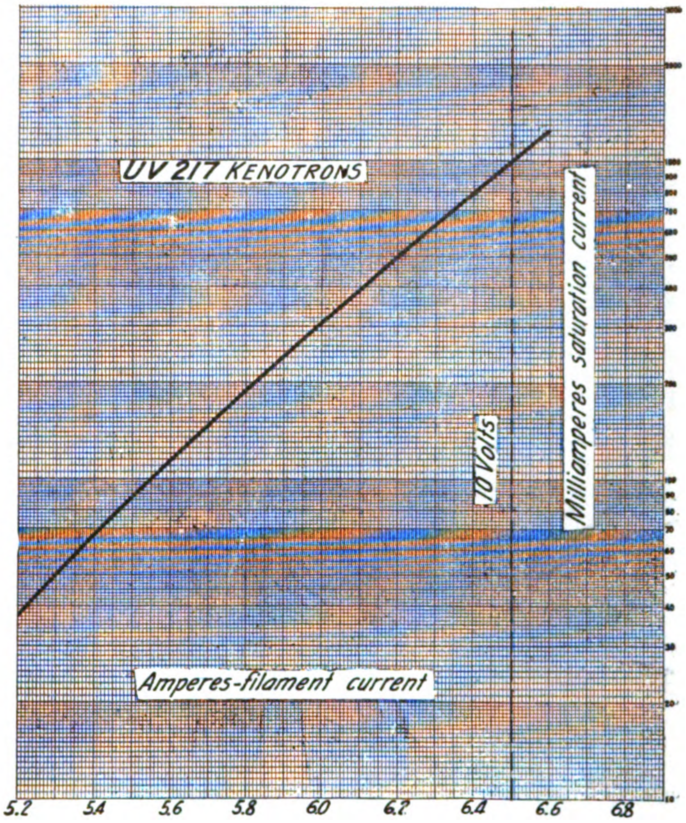


Figure 5—Saturation current graph

Based on these considerations of the space charge effect the characteristic curve of the Kenotron should be as shown by curve 1 in figure 9. From 0 to A the current between the filament and plate varies as the $\frac{3}{2}$ power of the plate voltage and is dependent upon the space charge effect. The horizontal portion of the curve represents the saturation current, that is, all the electrons emitted by the filament are drawn to the plate. The saturation current is shown in figure 5 for various filament temperatures (filament voltage).

We assumed in considering the effect of the space charge on the characteristic curve that the electrons were emitted at zero velocity. Actually the electrons are emitted throughout a considerable range of velocities, which results in a modification of curve 1, figure 9. The effect of the initial velocity of the electrons is to accentuate the depression of the curves shown in figure 8. We may consider that the initial velocity permits the emitted electrons to move further away from the filament against the opposing force of the field set up by electrons already in the space between the filament and plate. Under some conditions the potential distribution between filament and plate might approach that represented by curve 3, figure 8.

Curve 2, figure 9, represents the effect of the initial velocity of the electrons, which causes the curve to assume a position to the left of curve 1, throughout the lower portion of the curve. This indicates that the effect of the initial velocity is to increase the current between the filament and plate, especially at low plate voltages. This is, of course, what might be expected, since the effect of the initial velocity is to assist the plate voltage in drawing the electrons to the plate.

Since the filament is not an equipotential surface as we previously assumed, the characteristic curve may in some cases be considerably modified, especially if the voltage drop through the filament is an appreciable percentage of the saturation voltage. When the plate circuit is returned to the negative side of the filament the effect of the potential drop through the filament is to reduce the electron current, due to the fact that the average potential between the filament and plate is less than the potential between the negative end of the filament and the plate. This limitation in space current tends to neutralize the effect of the initial velocity of the electrons. The resulting characteristic curve is shown by curve 3, figure 9.

An additional factor tending to still further modify the characteristic curve is the limitation of emission from the filament as the plate voltage assumes values corresponding to the upper section of the curve. This limitation of emission results in the gradual bending over of curve 3 as shown by the dotted curve 4, figure 9.

Considering now the curve shown in figure 6 for $E_f = 10$ volts. We have found that the lower portion of this curve varies from the theoretical curve due to initial velocities and the potential drop through the filament. Also that the upper section is materially affected by the limitation of electron emission from the filament. An additional point to be noted is that the curves in figure 6 do not actually become parallel to the E_p axis as would be expected from wholly theoretical considerations. Instead of becoming level they continue to rise gradually as the plate voltage is increased. One reason for this effect is the increase in filament temperature due to heat radiated from the plate. We know that as the plate voltage is increased the electrons are drawn to the plate with a greater velocity. This electronic bombardment of the plate causes it to heat up. As the temperature of the plate increases the heat radiated to the filament becomes sufficient to increase the temperature of this element. This increase in temperature results in somewhat greater emission, hence a gradual increase in plate current beyond the knee of the curve.

Inspection of figure 6 indicates that curves for the higher filament voltage show a greater tendency to increase, after the saturated condition has been reached, than those for low filament voltages. This is due to the fact that the greater emission, when the higher filament voltages are used, results in a more severe bombardment of the plate, hence a higher plate temperature and more heat radiation to the filament.

The action and application of a Kenotron under various conditions may be illustrated by assuming the space charge effect equivalent to a counter electromotive force located within the Kenotron. The circuit arrangement based on this assumption is shown in figure 10. The circuit constants within the dotted circle represent the internal impedance and internal e.m.f. of the Kenotron. e_1 represents the space charge effect which has been found to limit the flow of electrons from the filament to the plate, hence we may represent this effect by a potential in opposition to that of the plate potential.

We have found that the volt-ampere or $I_p — E_p$ characteristic of the Kenotron is, in general, made up of three sections. We will consider only the approximately straight line portion of the characteristic. The portion of the characteristic in which we are interested is indicated by A.B.

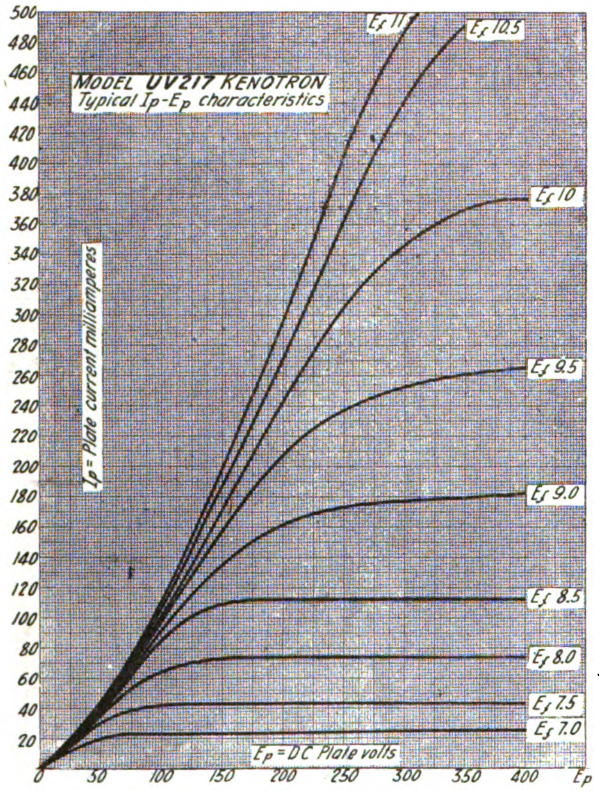


Figure 6—Volt ampere characteristics showing limitation of current due to temperature

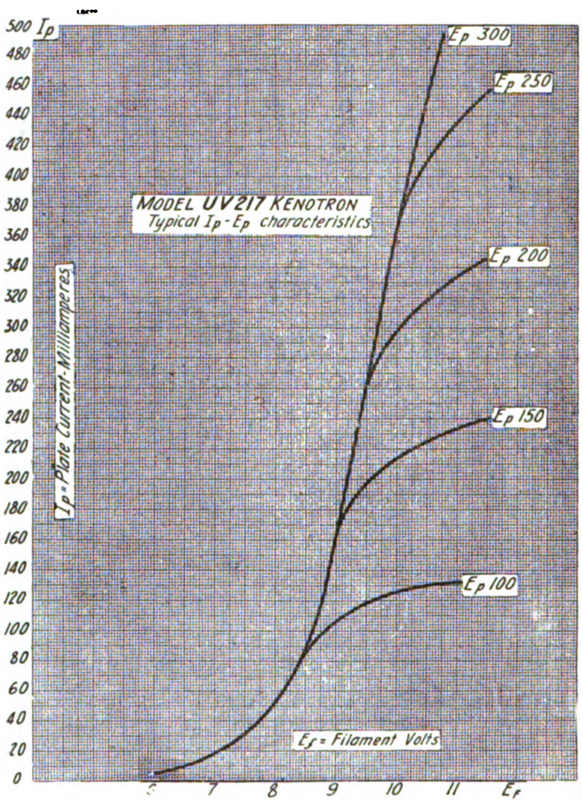


Figure 7—Volt ampere characteristics showing effect of space charge in limiting the electron current

figure 11, where the line has been extended to cut the e_p axis at the point A, resulting in the intercept O A. This intercept represents the value of e_1. We require the equation of this straight line. The equation of the straight line may be expressed in terms of the co-ordinates of any two points on the line and the slope. Hence if X, Y and X_1Y_1 are the co-ordinates of any two points and m the slope of the line, we have the equation:

$$Y - Y_1 = M\ (X - X_1)$$

If now the point B has co-ordinates (e_p, i_p) corresponding to X, Y, and the point A co-ordinates (e_1, o) corresponding to (X_1Y_1) we have:

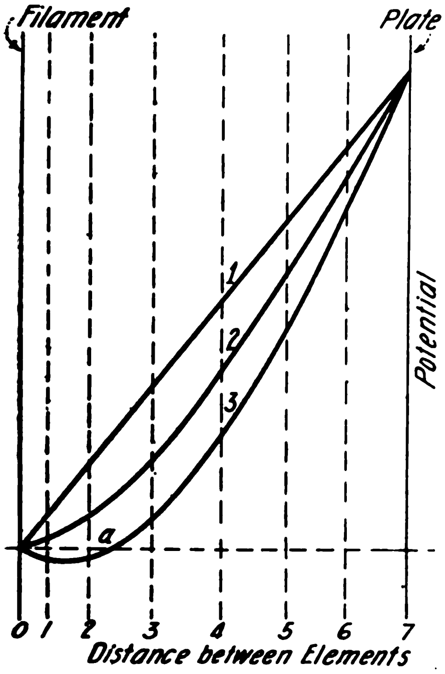


Figure 8—Potential distribution in the Kenotron under various filament temperatures

$$i_p - o = M\ (e_p - e_1) \text{ or}$$
$$i_p = M\ (e_p - e_1)$$

Since we are considering the entire line AB the slope M is simply the tangent of the angle between the line AB and the e_p axis, or—

$$\tan < B\,A\,C = \frac{BC}{AC} = \frac{i_p}{e_p}$$

This ratio represents a conductance and is sometimes called the conductance of the Kenotron.

If we consider the actual characteristic and take the ratio $\frac{i_p}{e_p}$ over a considerable portion of the curve we find that the apparent conductance of the Kenotron varies with e_p. Hence, in order to permit calculation we must determine the ratio $\frac{i_p}{e_p}$ for a very small section on the straight line portion of the curve. The conductance $\frac{1}{r_1}$ and counter e.f.m. (e_1) obtained in this manner may then be considered instantaneous values.

Let us consider the I_p — E_p curve (figure 6) obtained when the filament voltage was maintained at 10 and determine how the apparent conductance or its reciprocal, the apparent resistance, varies.

The following tabulation indicates how r_1 varies with E_p.

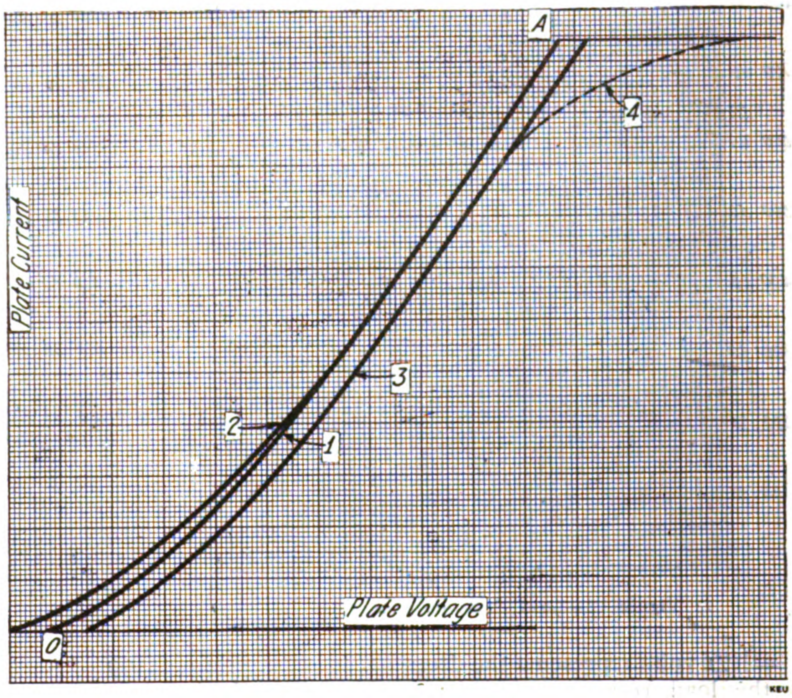


Figure 9—Modifying factors of the characteristic curve

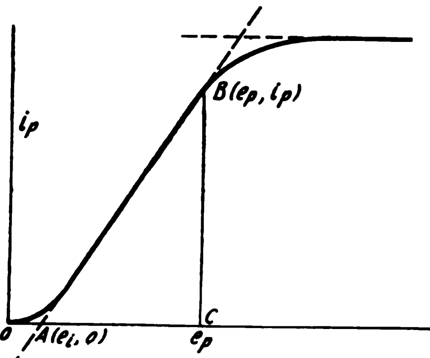


Figure 11—Section AB characteristics

E_p volts	I_p amperes	$\frac{E_p}{I_p}$ ohms
100	.101	990
125	.136	920
150	.171	878
175	.206	850
200	.241	830

If now we determine the instantaneous value of r_1 at several different points on the characteristic, we find that the instantaneous resistance is constant.

E_{p1}	E_p	$E_{p1} - E_p$	I_{p1}	I_p	$I_{p1} - I_p$	$\frac{E_{p1} - E_p}{I_{p1} - I_p}$
125	100	25	136	101	35	710
150	125	25	171	136	35	710
175	150	25	206	171	35	710
200	175	25	241	206	35	710

Suppose we wish to know the increase in current through the Kenotron when E_p is increased 20 volts, we may proceed as follows:

$$i_p = \frac{E_p}{r_1} = \frac{20}{710} = .028 \text{ amperes}$$

From the characteristic curve (figure 6, $E_f = 10$) we find that I_p equals .171 amperes when E_p equals 150, hence if E_p is increased to 170, I_p should increase to .199 amperes.

When a resistance r_p is inserted in the plate circuit, we have a series circuit containing two resistances and two sources of potential. The resultant potential in the circuit is e_p—e_1. The total resistance is $r_p + r_1$. Hence the current through the circuit is

$$i_p = \frac{e_p - e_1}{r_p + r_1}$$

This equation shows that the potential between the filament and plate of the Kenotron may be expressed as ($e_p - e_1$) or $i_p\ (r_p + r_1)$. If we consider only the straight portion of the characteristic and required the change in i_p corresponding to a variation in e_p we may write the equation

$$\Delta\, i_p = \frac{\Delta\, e_p}{r_p + r_1}$$

where $\Delta\ i_p$ and $\Delta\ e_p$ represent the increase or decrease in i_p and e_p, respectively.

If we insert a resistance of 1000 ohms in the plate circuit and provide a source E of 321 volts in the plate circuit, the current through the Kenotron will be .171 amperes. Since 1000 x .171 = 171 volts represents the drop across the load resistance, we have 321 — 171 volts applied to the plate. From the characteristic we find that $I_p = .171$ amperes when $E_p = 150$ volts. Or we may proceed on the following basis:

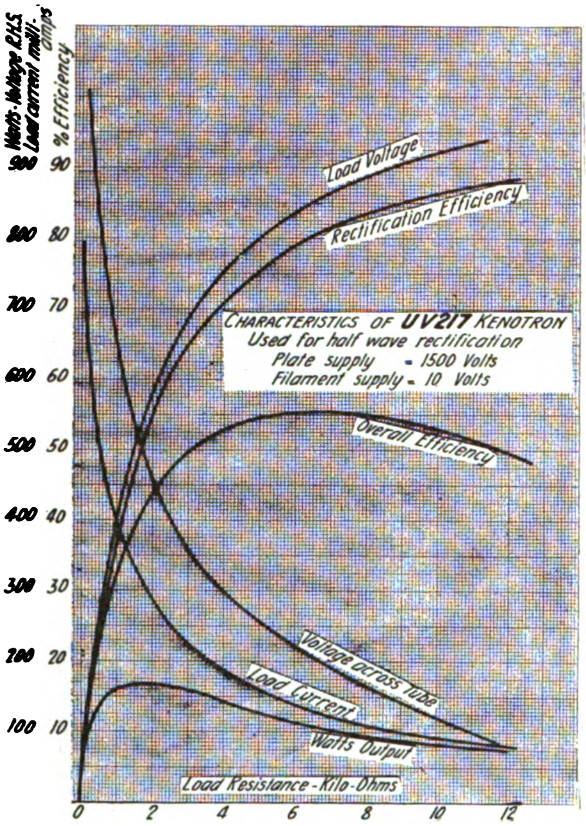


Figure 12—Load characteristics

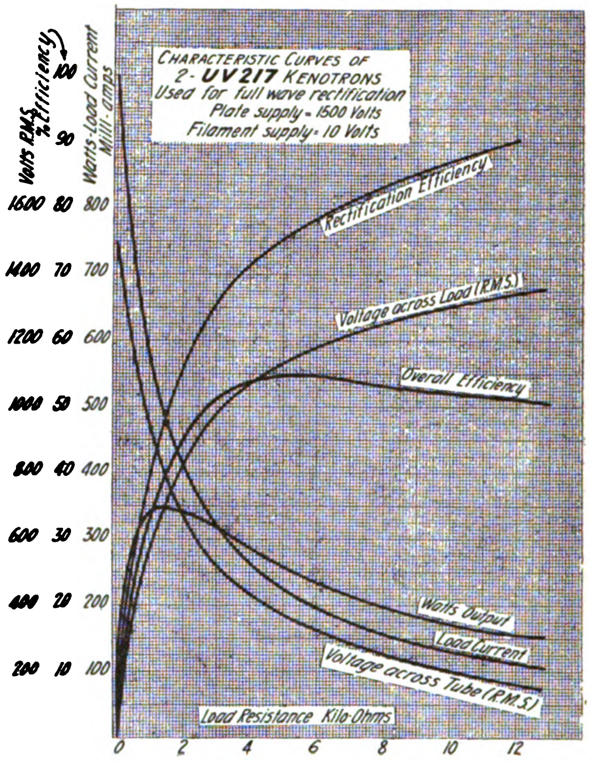


Figure 13—Load characteristics

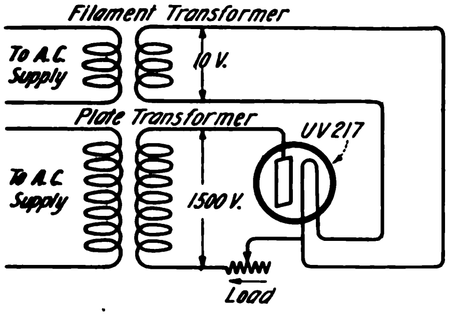


Figure 16—Circuit for half-wave rectification

$$E = 321 \text{ volts}$$
$$r_p = 1000 \text{ ohms}$$
$$r_1 = 710 \text{ ohms}$$
$$e_1 \text{ is unknown}$$

$$\text{hence} \quad i_p = \frac{321 - e_1}{1000 + 710}$$

The value of e_1 may be determined by the use of figure 11. Assume that point B represents the condition where $e_p = 170$ volts so that $i_p = .199$ amperes. If now we find the value of A C we can then determine O A, since O C = 170 volts. We know the slope to be $\frac{1}{r_1}$, hence

$$A\,C = \frac{.199}{\frac{1}{710}} = 141.3 \text{ volts}$$

$$\text{so that } e_1 = 170 - 141.3 = 28.7 \text{ volts}$$

Substituting $e_1 = 28.7$ in the above we have

$$i_p = \frac{321 - 28.7}{1710} = \frac{292.3}{1710} = .171 \text{ amperes}$$

The application of Kenotron UV-217 is essentially the same as that of UV-216. Load characteristics of UV-217 are shown in figures 12, 13, 14 and 15. These characteristics were obtained with the circuits for full and half wave rectification illustrated in figures 16 and 17. A comparison of the load characteristics with the rating of the UV-217 shows that this device is conservatively rated.

Filament volts, 10.0.
Filament amperes, 6.5.
A.C. Input Voltage, 1250.00.
D.C. Output, 150 watts at 1000 volts

The transformer indicated in the circuits shown in figures 16 and 17 was designed for use with Kenoton UV-217 and Radiotron UV-203. This unit which is known as Type UP-1016 (figures 18 and 19) has three secondary windings, one for the Kenotron filaments, one for the Radiotron filaments and the third for supplying the high voltage alternating current to the Kenotron plates. The Kenotron filament winding has sufficient capacity for two UV-217 Kenotrons. This winding is very carefully insulated since the Kenotron filaments assume a value equal to the plate voltage during the part of the cycle the tube is non-conductive. The Radiotron filament winding has a capacity sufficient to supply filament energy to two UV-203 Radiotrons. Both Kenotron and Radiotron filament windings are provided with mid-taps. This is not actually required for the Kenotron winding but provides a more flexible unit. The plate winding is designed for use with two UV-217

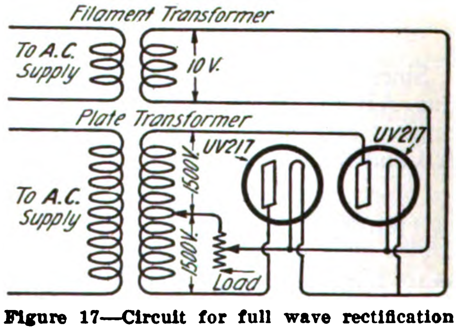


Figure 17—Circuit for full wave rectification

Kenotrons. Special attention has been given to the insulation and distributed capacitance of all windings to prevent break-down and losses due to radio frequencies by passing to ground.

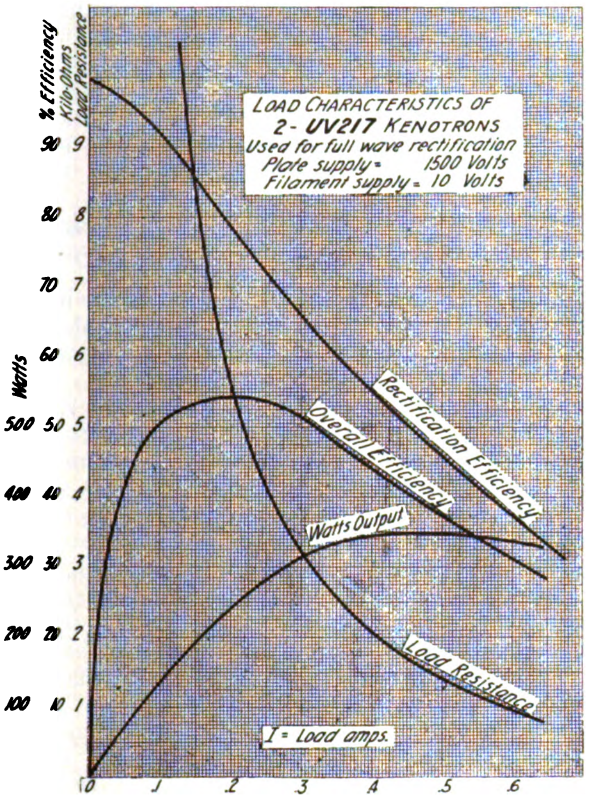


Figure 14—Load characteristics

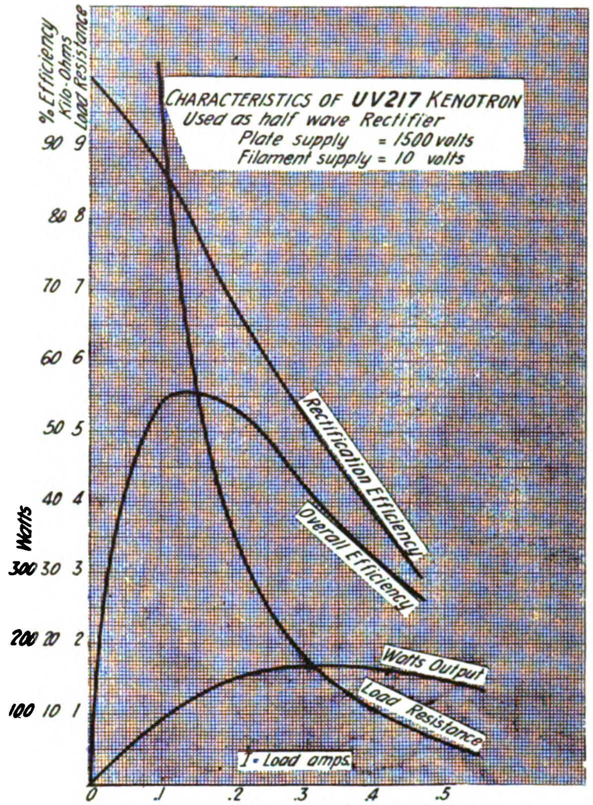


Figure 15—Load characteristics

The primary of this transformer is provided with taps and a selector switch. This arrangement eliminates, except in special cases, the use of filament rheostats since the taps correspond to values of line voltage usually available at the amateur station.

The windings are so designed that when the selector switch is set on a tap which results in the proper voltage on any one secondary winding, then the other two secondary voltages are correct. A voltmeter should not be connected across the Kenotron filament winding due to the fact that this winding is at plate potential during a portion of the cycle.

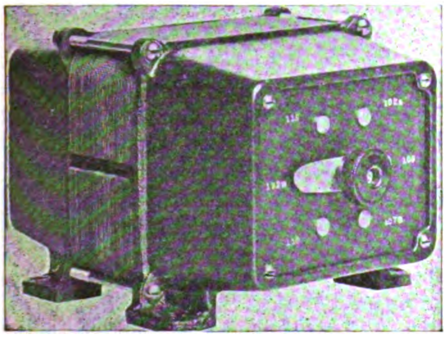


Figure 18—Amateur radio plate and filament transformer. Front view showing the switchboard

The operating precautions that should be observed with the UV-217 are in general the same as for the UV-216. It has been shown that from theoretical conditions alone the current through the Kenotron should increase with the three-halves power of the voltage until the saturation current is obtained—

$$i_p = KV\,\frac{3}{2}$$

where V equals the potential between the plate and filament and K is a constant depending upon the shape of the electrodes. When a resistance is connected in series with the plate and a voltage E impressed across the circuit, we have

$$i_p = K\,(E - i_pR)\;3/2$$

If E is maintained constant the rectified current continues to increase as R is decreased until the saturation current is reached. A further decrease in R produces no increase in the current passing through the Kenotron with the result that the voltage across the tube increases. That is, the drop across the tube always equals the difference between the potential across the entire circuit less the drop (i_pR) through the load. If the load resistance is reduced to zero then the total voltage is applied directly to the Kenotron so that all the energy is liberated at the plate. The effect of a short circuit on the Kenotron is, therefore, quite likely to ruin the tube either by evolving gas or melting the plate.

In order to obtain long life, it is of course necessary to never exceed the maximum rated filament voltage which, with the UV-217, is 10 volts. The operator should always bear in mind that, if the filaments are maintained at a voltage approximately 5 per cent. above normal, the life of the tube is halved. Also that operation at a filament voltage 5 per cent. below normal results in doubling the life of the Kenotron.

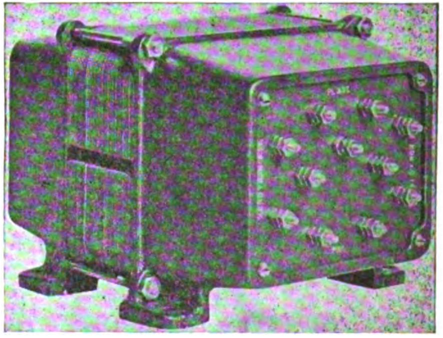


Figure 19—UP-1016 Amateur radio plate and filament transformer. Rear view showing the terminal board

RADIOPHONE BROADCASTING

At the WDY and WJZ Radio Studios

EACH day the popular interest in radiophone broadcasting becomes more intense and widespread. Not a little credit for the recent rapid development of this popular interest may be given to the Radio Corporation of America and the Westinghouse Electric and Manufacturing Company, which have provided the means for broadcasting over large areas the radiophone news bulletins, concerts by famous singers and musicians, addresses by noted speakers, weather and market reports, stories for children and interpretative opera recitals.

The daily programs are of a high order and provide a great variety of entertainment. The following are some of the artists and speakers that have recently appeared at WDY and WJZ radio studious:

Artists—Mlle. Fanny Rezzia of the Paris Grand Opera; Premier Male Quartet composed of Messrs. Bradley, Cole, Bier and Brasch; Miss May Peterson, Metropolitan Opera Co.; Marie Sundelius, Metropolitan Opera Co.; Joseph Meyer, Musical Director at Pasadena Hotel, California; Sophie Tucker, vaudeville star; Jack Neal of George White's "Scandals"; Bennie Davis, composer of "Margie"; Joe Collins, saxaphone artist; Miss Berta Reviere, contralto; Billy Hettrick, baritone; Miss Vivienne Segal, star of "The Blue Paradise"; Franco Pizzo, Italian Violinist; Ignatz Friedman, pianist; John Stell, star of "Monsieur Beaucaire"; Mme. Lydia Lipkovska, Imperial Opera at Petrograd; Reginald Pasch, tenor from Holland; Vernon Dalhart, Edison Recreation tenor; Constance Rowland, violiniste and Miss Elizabeth Spencer, soprano for Edison Recreations.

Speakers—Gov. Edward I. Edwards of New Jersey; Joseph P. Tumulty, Ex-Gov. Runyon of New Jersey; Herschel Jones, Food Commissioner of New York; Eddie Rickenbacker, premier American Ace; Roger W. Babson, business economist and statistician; Edna Ferber, short story writer; Sanford Hunt, adventurer, writer and sportsman.

Operatic Recitals—Madame Butterfly, Faust, Cavalleria Rusticana, Il Pagliacci, Carmen, La Boheme.

Sermons—Rev. Charles Lee Reynolds, D.D., Park Presbyterian Church, Newark, N. J.; Rev. M. Joseph Twomey, D.D., Peddie Memorial Baptist Church, Newark, N. J.

Broadcasting Stations

WDY—360 meters. Mondays, Wednesdays, and Fridays 11 A. M. to 10 P. M. Radio Corporation of America, at Roselle Park, N. J.

WJZ—360 meters. Sundays, Tuesdays, Thursdays and Saturdays, 11 A. M. to 10 P. M. Westinghouse Station located at Newark, N. J.

WDY and **WJZ** are in the New York District.

KDKA—360 meters. Daily, 8 to 10 P. M. Westinghouse Station located at East Pittsburgh.

WBZ—360 meters. Sundays, Mondays, Wednesdays and Fridays, 8 P. M. Westinghouse Station located at Springfield, Mass.

KYW—360 meters. Daily, 8 P. M. Central time, 9 P. M. eastern time. Westinghouse Station located at Chicago, Ill.

To the average person who desires to listen to concerts of an evening, dance to popular music, hear a sermon on Sunday or an address during the week, or to have his little ones hear a bed-time story before they say their evening prayers, the radiophone—as it exists today—with its nominal first cost and simple installation and operation, surpasses everything as an instrument of entertainment and education in the home.

Regarding Visits to WDY

IN reply to many requests from correspondents for invitations to visit the Radiophone Broadcasting Studio WDY, we desire to state that at this time it is practically impossible to extend such invitations due to limited space in the studio. Artists and operators at the station require all the accommodations now available and it is hoped that our radio friends will understand that we would gladly welcome visitors generally if proper accommodations were possible. It is hoped that in the near future necessary arrangements can be made to enlarge the present size of the studio so that a number of our many friends can be invited to visit us.

Faust Popular With Radio "Fans"

IT is interesting to note that the opera "Faust" was selected for broadcasting by WDY because of the majority request of a large number of radio "fans" who wrote in to the company. "Faust" is not alone popular among wireless enthusiasts, but is probably the most popular of all music dramas among opera-goers.

Banquet Music by Radiophone

THE latest convert to the fascination of the wireless 'phone is the New York State Association of Electrical Contractors and Dealers, which held its annual banquet at the Hotel Astor. The after-dinner speeches consisted of a half hour of musical entertainment by the radiophone.

Baseball "Fans" Hear Frisch by Radio

FRANK FRISCH flashed a snappy baseball talk into the transmitter at WDY recently in describing his activities on the diamond.

It was the first time Frisch had ever "toured" with a concert troupe. For he went to Roselle Park, from New York with the Premier Quartet, which followed Frankie on the bill, while the Flash made his "appearance" immediately after the news reel. He flashed a beautiful San Antonio sunburn shade when he was "introduced" to his invisible audience. His hearers in the 200 mile radius were many times the number of a world's series game crowd and he seemed to fear at first that some voice from the "stands" might give him the razz. But no one talked back to Frankie; it was a great opportunity to practise telling an umpire what you thought of him. But Frank warmed to his part and gave a neat little talk on baseball, answering questions that were put to him by a few onlookers in the "sending studio" of the broadcasting station and pepping up his chatter with a little persiflage.

With a little more practice he ought to be ready for a monologue act on the variety stage. His one regret was that he did not bring his violin along with him. Frank would have been less "fussed" fiddling than talking. He prophesied over the radio that the Giants would win the pennant again and hoped they might meet the Yanks again for the world's series. He denied that he had been given a mortgage on the Polo Grounds as part of his salary increase. "I don't mind being moved from third back to second to make room for Heinie Groh," he told radiophone fans who were listening in on the "WDY" call, "for I have confidence in Manager McGraw and know that whatever way he arranges his players it is always the wise way and the way that works out best for every man under his command."

"Gee! I'm glad that's over," breathed Frank when finally J. Andrew White, editor of THE WIRELESS AGE, lifted the earpiece from his head. "My knees were actually shaking when I started to chin into that fool thing. I'd rather bat against Wilbur Cooper all season than do that again. If I'd only thought to bring my violin! If any fans out in St. Louis, where they 'love' the Giants so, heard that stuff of mine they'll probably want to sue Mr. Radio for breach of contract. Tough luck for people who thought they were going to hear a concert to have a ball player palmed off on 'em. And I needed a shave, too.

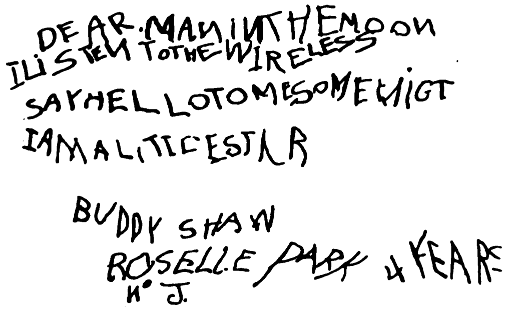
"Say, that radio jigger is a pretty nifty thing when you come to think of it," said Frank on the train coming back to New York that night. "I s'pose these electrical sharps will be building a baseball radio machine soon for use in coaching. Mac ought to hear of it. He would be ordering one to use from the bench. Every base runner could be equipped with a receiving apparatus like I read the Chicago taxicabs are fixed up with, and with a private code of trick letters the guys could be moved around as directed without the aid of the men on the coaching lines."

Radio Cheers the Aged

ALTHOUGH more than 80 years old, Mrs. Lavinia Campbell has had installed in her room at the home of her daughter in Flushing, L. I., a complete wireless outfit from which she receives messages daily.

Clocks in the Campbell household are set by reports from Arlington, weather reports are received from Washington and messages are received from ships at sea.

Mrs. Campbell is planning a wonderful treat for her little friends among the children in the neighborhood and she has set aside the hour from 2 to 3 o'clock each day for the youngsters' radio party.



DEAR MAN IN THE MOON
I LISTEN TO THE WIRELESS
SAY HELLO TO ME SOME NIGT
I AM A LITTLE STAR

BUDDY SHAW
ROSELLE PARK 4 YEARS
N. J.

From one of our little listeners

Radio Sermon by Rev. Dr. Reynolds

WITH only the collection and congregational singing omitted, Rev. Dr. Charles Lee Reynolds, pastor of the Park Presbyterian Church, Newark, preached a sermon, offered prayer, read the Scriptures and made announcements on a Sunday afternoon recently at WJZ to an unseen audience estimated to have numbered half a million.

Artist and Audience

The artists and speakers at the various radio phone studios and their unseen audiences can meet in the columns of THE WIRELESS AGE if readers will send in short descriptions and photos of their radio parties, consisting of group pictures including the radio apparatus. The Radiophone Broadcasting department will serve audience and artist alike by presenting whatever is of interest to either, so send in your stories and let's get acquainted.

Clarence E. Watters, church organist, played a prelude and a postlude, and accompanied Mrs. Persons, soloist of Park Church, in a hymn.

The service lasted half an hour, Dr. Reynolds preaching twenty minutes. Referring to an offering, Dr. Reynolds said over the instrument:

"At this point in any service we would take up the collection, but I don't see how I can ask my radio audience to give an offering and I can't ask you to 'join' in singing a hymn."

Dr. Reynolds remarked after the service that he thought those edified by "listening in" on these radio sermons might be encouraged to send in offerings in order to install instruments in hospitals where invalids could hear sermons.

Dr. Reynolds had received a letter from his mother, Mrs. James E. Reynolds, at South Bend, Ind., saying she would be one of the "listeners in." He also was informed by telegram that many of his former parishioners at the Second Presbyterian Church, Lexington, Ky., would gather in the engineering department of the university of that city to hear the sermon.

In W D Y Mail Box

That's the "stuff." We want "Radio Vaudeville."

Mother and Dad like old-fashioned songs, while I like concerts. Mr. Cook was very good, but so were all the rest.

I have listened in on your concerts and will tell you that I appreciate them immensely as that is my sole recreation. I am nearly blind and therefore not able to see good shows or other recreation known to other young men.

All hail to the Radio Rajah of Roselle!

We enjoyed a good waltz to "Peggy O'Neil."

I really think it is a most wonderful thing to be able to sit home by a fire place and listen to the wonderful concerts.

Enjoyed your dance program very much last night, though we didn't have a very good floor.

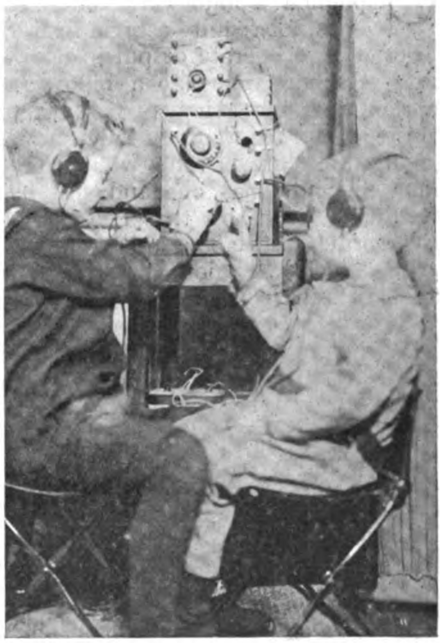
The music was enjoyed very much here and we all shook a "lean foot" as you called it.

Wish to commend you upon the qualities of the transmission, and what is equally desirable, the inimitableness of your officiating disseminator.

We danced downstairs to the music coming in upstairs. We are more than 1000 miles from your station. Your operator is a genius—a very accommodating fellow and very pleasant gentleman. I feel almost personally acquainted with him and should be glad of the opportunity sometime to meet him.

Your modulation is the best of any radiophone that I hear and I get a lot of them.

Those Saxaphone solos have got the world cheated for anything in the solo line, so we are living in hopes that you can arrange to give us some more Saxaphone music. The whole town is going wild about your music and talks, as it is by far the plainest and strongest we have heard.



Members of the radio broadcasting audience

I want particularly to express my appreciation of the gentleman who, I take for granted, is in charge. I am as expectant of his announcements as I am appreciative of his selections.

We especially enjoyed the rendering of the opera "LaBoheme" and certainly would appreciate more of the same kind of music.

It was fine, and we had "just as good a time as you had"—dancing.

Wonderful!
Delightful!
Yours truly.

We enjoy your parties very much. What my wife likes most is the announcements. I'm glad we live so far away or she'd be on your trail, I'm afraid. But then we are both over fifty, so your girl needn't fear. From your voice you seem to be twenty-nine, medium dark, medium tall, gray suit and a striped tie. So if my wife really saw you there would be nothing doing. More power to you.

(Continued on page 50)

EXPERIMENTERS' WORLD

Views of readers on subjects and specific problems they would like to have discussed in this department will be appreciated by the Editor

A 5-Watt Vacuum Tube Transmitter

By Geo. Louis Gates

FIRST PRIZE $10.00

CONTRARY to a seemingly popular opinion, a "fone" set does not require a great deal of experience to operate or put in operation. A short time ago a fellow remarked that when it was possible to construct a "fone" set without mortgaging the "flivver" he would have one. He now has one and still has the flivver. The set that I am going to describe costs about thirty dollars, so the flivvers are not in danger. The set has been in operation since July and has cost thirty cents upkeep in all that time. It has given very satisfactory results both with voice and C. W. The voice range is 25 miles, but it has been reported QSA at 33 miles. The C. W. range is in the neighborhood of 150 to 200 miles.

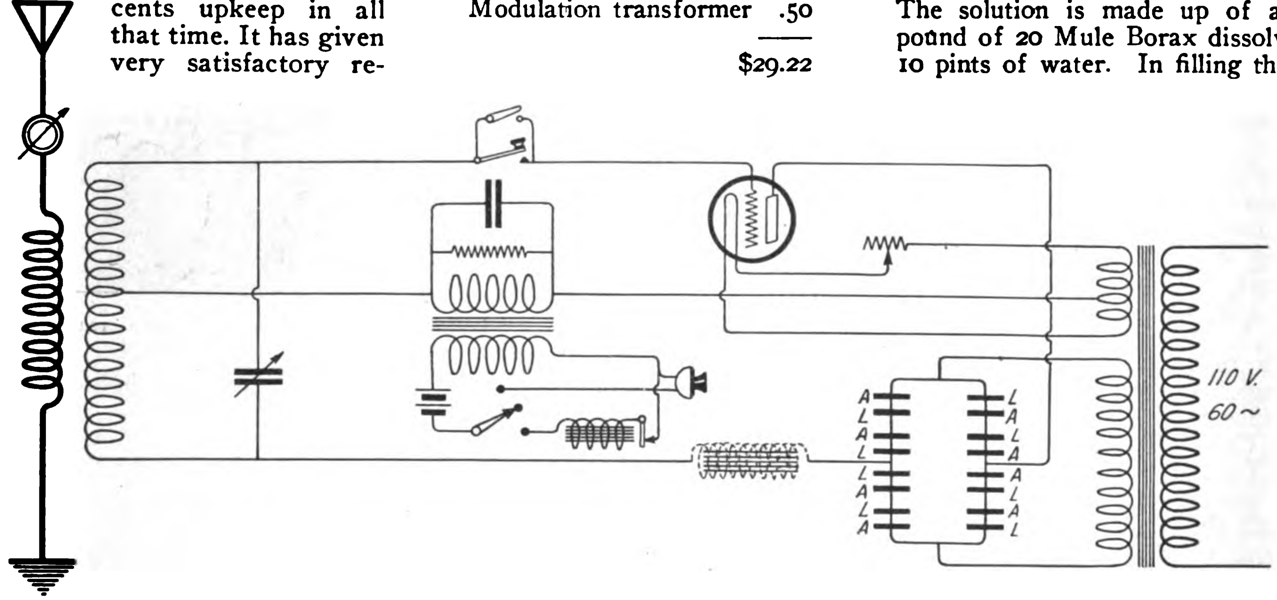


Figure 1—Circuit diagram of the 5-watt vacuum tube transmitter

If the constructor has no apparatus at all the set would cost about thirty dollars to duplicate, but as the average amateur no doubt has some old apparatus he can easily build one considerably cheaper. The expense is itemized below:

Transformer core	$.30
1 lb. No. 22 enameled wire	.75
2 lbs. No. 28 enameled wire	1.50
Lead strips	.10
20 Mule Borax	.12
Aluminum strips	.25
5 Watt Radiotron	8.00
Socket	1.00
Grid leak	.10
Grid condenser	.10
Choke coil	.50
Variable condenser	4.25
Inductance	.25
H. W. A.	7.00
Buzzer	2.00
Microphone	2.50
Modulation transformer	.50
	$29.22

The transformer is, probably, the hardest part of the set, but if properly constructed it will give much better results than a motor generator or B batteries, besides being lower in cost of construction or upkeep. The core is made of stove pipe iron which is cut in the shape of an L. The size of the core when completed is 7x5x¾ inches. About 150 pieces of stove pipe iron 7x5 will be needed and almost any hardware concern carries the iron and will cut it to your specifications. The primary and secondary can easily be wound on a lathe made from a breast drill. The primary has 425 turns of No. 22 enameled wire. The secondary has 2,550 turns of No. 28 enameled wire. No center tap is taken. The filament winding has 40 turns of No. 22 enameled wire. The filament winding is tapped at the twentieth turn. It is important to separate each layer of wire with a layer of paper. The primary and filament are wound on the same leg while the secondary is wound on the opposite leg.

The rectifier is of the aluminum-lead type which gives very good results. The rectifier consists of eight Mason pint jars, eight lead strips 5x¾ inches, and eight aluminum strips 5x¾ inches. The solution is made up of a half pound of 20 Mule Borax dissolved in 10 pints of water. In filling the jars with the solution care should be taken that none of the sediment remains in the jars. The jars should be filled about three-quarters full. The diagram shows the order in which the plates are connected together.

Although there is, locally, a noticeable hum if no filter system is used the modulation is not distorted. This hum can only be heard a short distance from the transmitting station. The hum may be reduced considerably if a Ford coil secondary is used as a choke coil. Although I eliminated the hum with the choke coil I cut my range with voice from 30 miles to 25 miles.

The type of tube used will depend upon the pocketbook, but the Radiotrons are more stable and give more output than other tubes. Any type of socket may be used but care should be taken that the high voltage does not leak from the plate point to the filament or grid, as this will spoil the efficiency of the set. A rheostat may be used for the filament, but I found that the filament voltage from the transformer was just right for the Radiotron tube, which must be lighted to full brilliancy if the maximum output is to be obtained.

The modulation transformers put out by the various manufacturers are very good, but a Ford coil will give good modulation and is considerably cheaper. The vibrator should be tightened up so as to insure good contact. The fixed condenser shunted across the secondary should be of about .001 mfds. capacity. The grid leak is a Venus pencil No. 2B, which may be connected from the grid to the filament to afford a slight increase in radiation, though the modulation is somewhat distorted.

The primary of the inductance is wound with No. 18 bell wire on a 3½-inch cardboard tube. The coil has 26 turns and is tapped at the thirteenth turn for the filament lead. The secondary has 8 turns of the same size wire without taps. The windings should be separated about a half inch.

Any standard radiation ammeter with low reading scale may be used. If the constructor wishes he may substitute a 3-volt flashlight bulb for the ammeter with fair results. Of course, the flashlight bulb will not tell when maximum radiation is obtained, but the set will give good results if tuned only with the flashlight bulb.

A few words concerning the operation will no doubt be useful. The plates of the aluminum-lead rectifier must be formed before the rectifier will work. A simple way to form the plates is to connect in a 50-watt incandescent bulb and let the 110 volts 60-cycle current run about ten hours. The plates will form faster if a larger bulb is used though the slower the plates are formed the better the results.

In applying the high and low voltages to the transmitting tube the filament should always be lighted before the high voltage is turned on. The high voltage should never be left on the plate of the power tube unless the filament is lighted as the high voltage will tend to break down the construction and insulation inside the tube.

In order to make the set operate the key in the grid circuit must be closed when voice modulation is desired. The set is tuned by turning the variable condenser until the flashlight or ammeter shows the greatest reading. The beauty of this circuit is that it requires no skill to tune the set and is therefore easily kept in operation. The microphone should always be disconnected from the battery when not in use as the carbon granules will become packed and the modulation will become distorted or entirely eliminated.

Simplicity was the keynote in this construction and, as the fellows will testify, the efficiency was not hampered by simplicity. The set must work well as there is nothing hard or delicate to adjust. To tune the set simply turn the condenser.

If the constructor encounters any difficulty in constructing the above set I will be glad to answer any questions addressed care of The Wireless Age.

A 5-Watt Tube Transmitter

By Floyd Rittman, 8BAF

SECOND PRIZE $5.00

DURING the past summer I built and operated the phone set which I am going to describe. I did not get the opportunity to mount the apparatus on a panel, but this could be done very easily if desired.

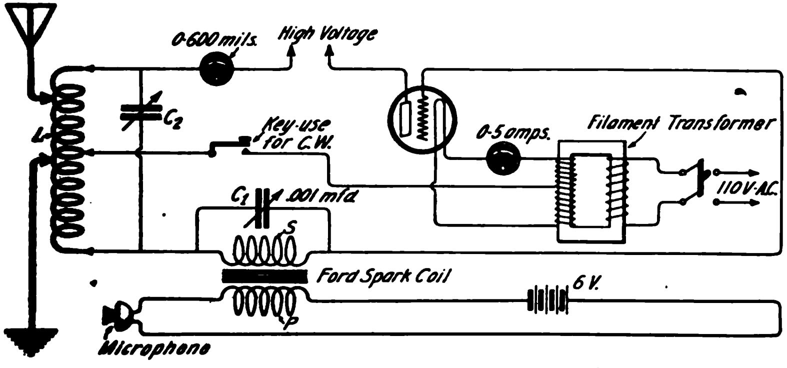


Figure 1—Circuit of the 5-watt tube transmitter

The circuit shown in figure 1 is the one which I am using.

The inductance is made up of thirty-five turns of bare copper wire, size eighteen, wound on a tube four and one-half inches in diameter. A space one-sixteenth of an inch wide is left between each turn. There are five taps to be taken from this coil and each one is variable.

The easiest way to mount this inductance and make the taps variable is to mount the inductance like a tuning coil, making the end blocks a little wider than usual. Mount two pieces of fibre about three inches wide and as long as the coil mounting upon the end blocks so that they run from end to end and have a space of about three inches between them. Five rotary switches mounted upon these strips so that the switch blades run upon the coil secures five variable contacts from the inductance. Figure 2 may make this clear.

A variable condenser, C_2, is shunted across the inductance to assist in tuning. The capacity of this condenser need not exceed .0005 microfarad. The current for the filament may be supplied either by a storage battery or taken from a step-down transformer. It is far cheaper to use a transformer and the results are just as satisfactory. A center tap has to be taken from the filament winding. If the transformer has two five-volt windings in series the object is easily accomplished. If it is in one winding, a resistance of not more than one hundred ohms may be shunted across it and a center tap taken from that.

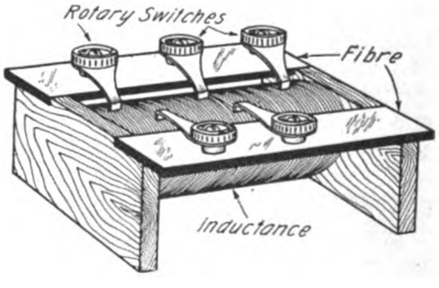


Figure 2—Five rotary switches used to secure variable inductance

A cheap source of direct current for the plate is the object which every amateur is striving for. From my point of view, rectified alternating current is the cheapest, besides being more easy to obtain and most efficient.

The following data will come in handy in constructing the C.W. transformer. The size of windings may be obtained by noting your core size on the left and reading over.

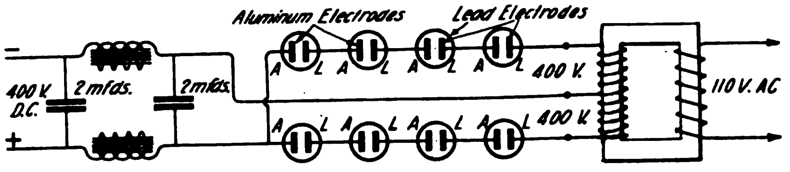


Figure 3—Hook-up of the electrolytic rectifier

Cross section of core in square inches	Turns per volt.	Number of turns on primary	Number of turns in each 400-volt secondary pie
1 "x1¼"	5.5	605	2200
1¼"x1¼"	5	550	2000
1 "x1½"	4.5	495	1800
1¼"x1½"	4	440	1600
1½"x1½"	3.5	385	1400
1¼"x2 "	3	330	1200
1½"x2 "	2.5	275	1000

The primary is wound with size twenty, double cotton covered copper wire, and should be well insulated from the core. The two secondary pies are wound with size thirty, double cotton covered copper wire. It is not advisable to use anything finer than this because the transformer will heat up considerably when first used. Referring to the table, if the cross section of your transformer is three square inches, we find that the last line in the table applies to your case, and your primary will have two hundred and seventy-five turns; the secondary will be made up of two pies, each containing one thousand turns of wire.

An electrolytic rectifier of twenty cells is used to rectify the alternating current delivered by the transformer. Test tubes can be used for the cells of the rectifier and a concentrated solution of "Twenty Mule Team Borax" forms the electrolyte. The electrodes are pieces of lead wire and aluminum aerial wire. The diagram of the hook-up is given in figure 3.

The rectified current is pulsating, and to smooth it out two microfarad fixed condensers are needed. If enough condensers are used there will be no choke coils required. A Ford spark coil is used as a modulation transformer. The secondary is connected in the grid circuit, and shunted by a .001 microfarad variable condenser. The vibrator is removed from the coil, and an ordinary telephone transmitter and a six-volt battery connected in series with the primary. There are two meters required: first a milliammeter, scale 0-600 mils. This is used first in the plate circuit, and shifted to the aerial circuit, when the bulb begins to oscillate. The second is an ammeter, scale 0-5 amperes, and is used in the filament circuit. The filament of a five-watt tube should not draw more than two and four-tenths amperes.

In sending with C.W. the key may be placed in two places. The first is in the filament connection to the inductance, as shown in the diagram. The second place is in the primary circuit of the high tension transformer. The second position is the better because it permits the use of a shorter connection from the filament to the coil. If the set refuses to work try reversing the high voltage connections, and make sure that the condensers across the line are not blown. An open secondary in the spark coil will also keep the set from working.

The variable condenser which is shunted across the spark coil has a great deal to do with the modulation. It will be noticed that as the capacity of the condenser decreases the radiation decreases. The drop in radiation is slow at first, and then abrupt. At a point just preceding this drop, the modulation is best. This may be seen by listening in on the receiving set while the phone is being adjusted.

Under favorable conditions this set will radiate six-tenths of an ampere C.W., and four-tenths of an ampere on voice. With six-tenths of ampere radiation and a favorable location, distances up to one hundred miles can be covered easily.

An Efficient 5-Watt Tube Transformer

By L. R. Felder

THIRD PRIZE $3.00

In the April issue of The Wireless Age, a vacuum tube transmitter was described which was found to be very useful and efficient. Not much design data was given at the time and it is the writer's purpose now to consider the design of this circuit to secure maximum efficiency and to adapt this circuit for use on 110 V. D. C. power lines.

The efficient design of a circuit for use with vacuum tubes consists essentially in the choice of proper circuit constants. Thus a circuit which is well designed in all other respects may be made very inefficient by the choice of wrong constants for grid condenser and leak. Furthermore it is important to note that circuit constants which are suitable for one particular type of vacuum tube may be altogether inefficient when used with another type of tube.

The complete oscillating circuit excluding the filter, in this transmitting set is seen in figure 1. The constants of this particularly circuit are intended for use with two UV-202 Radiotrons. The filament current may be obtained from a 12-volt storage battery in series with a filament rheostat. The operating current in the filament should be 2.4 to 2.5 amperes. It is recommended that a voltmeter across the filament terminals be used instead of a series ammeter, and that the voltage across terminals be kept at 7.5 volts. This will result in a longer life for the tube. The circuit requires a plate-antenna transformer, antenna series condenser, grid con-

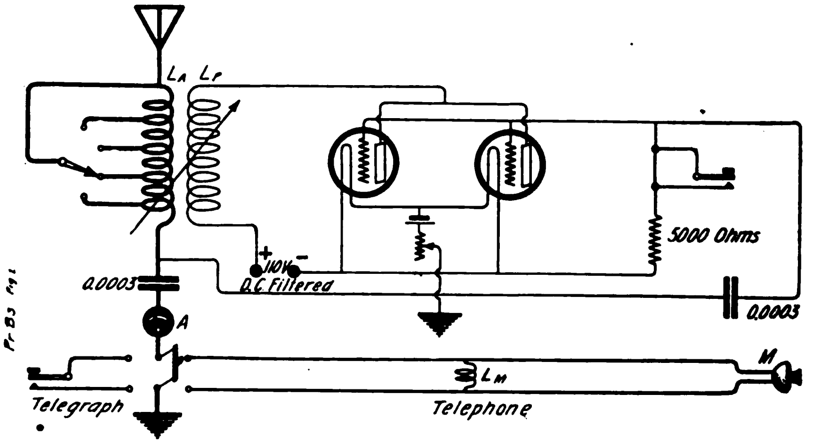


Figure 1—The complete transmitting circuit excluding the filter

denser and leak, and for telephony, a microphone and microphone inductance.

The grid condenser and leak have specific values found to be suitable for the UV-202 tubes. The grid condenser capacity is .0003 microfarad and the grid resistance is 5000 ohms. These should be fixed and not variable, as no advantage is gained by making them variable. The antenna condenser should be .0003 microfarad and fixed.

The design of the plate-antenna transformer is one of the most important elements of vacuum tube transmitter design, and it will be found that in most instances it is here that sets fail. In order to design this unit properly it is necessary to understand its function. It is, of course, known that the antenna coil serves to tune the antenna to the transmitting wave, but the antenna inductance is one coil of the plate-antenna oscillation transformer. This transformer has the extremely important function of "adapting" the transmitter tube to the antenna. It has been demonstrated in numerous articles that maximum output and efficiency in a vacuum tube transmitter will be obtained when the internal impedance of the tube equals the impedance of the output circuit. Now the internal impedance of our two UV 202 tubes (parallel) is 2000 ohms. Our antenna circuit has a resistance of 8 to 15 ohms. How can these be equalized to secure maximum output and efficiency? By properly designing the plate-antenna transformer, so that by varying the coupling, the transformation ratio of the antenna is "adapted" to the tube, and the transferred impedance of the antenna in the plate cicruit will equal the plate resistance of the tube.

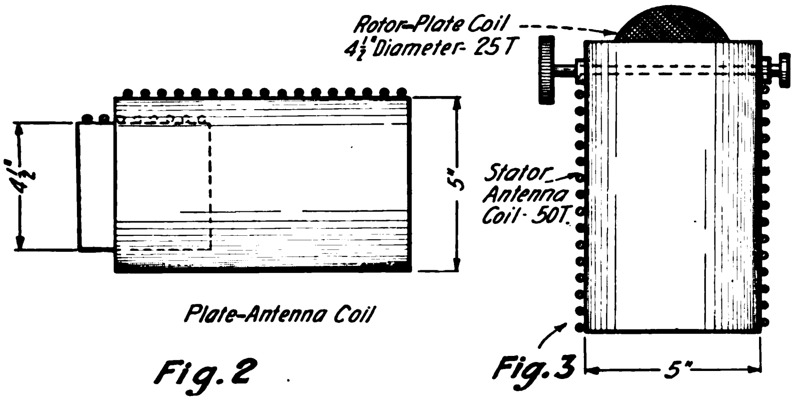


Fig. 2 Fig. 3

Constructional dimensions of two types of plate antenna coil

This means then that the plate-antenna transformer should have its transformation ratio variable and also its coupling. The plate-antenna transformer design here described is intended for use with the UV transmitting tubes. The plate coil should be about 4½ inches in diameter and should have 50 turns of No. 18 D.C.C. wire. The antenna coil should be 5 inches in diameter and have 25 turns of No. 18 D.C.C. The entire winding in the plate coil can be efficiently utilized. The antenna coil, however, both for tuning purposes and for adjustment to the plate coil, should be tapped at every three turns. The mechanical design of the coil and the means for coupling variation are numerous and well known to most amateurs. However, two suggestions are here offered. Figure 2 shows one design utilizing two coaxial cylindrical coils, the inner plate coil being movable relative to the outer antenna coil, in this way permitting coupling variation. Figure 3 shows a sketch for a variometer transformer, the coils having the same number of turns as above. The variometer transformer is recommended for those making a panel type of set.

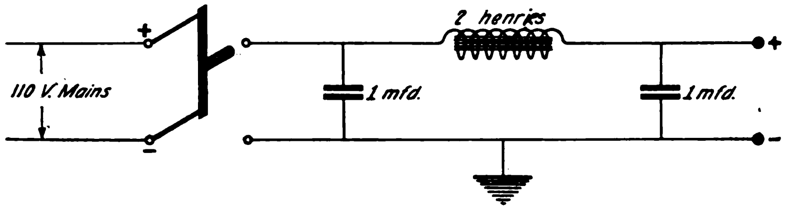


Figure 4—The filter circuit

The telegraph key may be placed in series with the antenna as shown, or in series with the grid leak, as shown in the dotted lines figure 1. Both positions give excellent results. For telephony the best place to put the microphone is in series with the antenna. It is also the simplest place requiring a minimum of apparatus. It simply requires a small shunt inductance (L M) which serves the purpose of deflecting a portion of the antenna current, since the entire current need not pass through the microphone, and thus avoids packing. The complete constructional details of this inductance are simply 4 turns of the No. 12 bare copper wire, spaced one-half inch between turns, on a wooden form one inch in diameter and two inches long. The microphone should be a Western Electric 284-W.

Finally we consider the design of a suitable filter to permit using the 110-volt D.C. mains. Unless a filter is used there will be a strong commutator hum which will be applied to the plate of the vacuum tubes and will thus produce an undesirable modulation which interferes with reception. The filter absorbs this commutator ripple. Figure 4 shows the complete filter circuit which, when designed as shown, will eliminate the hum completely. Across the mains a 1-microfarad condenser is used, such as a paraffined paper telephone condenser. On the positive side of the line an iron core choke having a minimum induction of two henries is connected and then another 1-microfarad condenser. Any large iron core inductance, such as the secondary of a spark coil (primary open) will be satisfactory. The negative side of the line should be grounded, for then practically absolute silence is obtained.

This set will be found extremely simple to construct and operate. It requires but few parts and has only two simple adjustments, namely, plate-antenna coupling and antenna tap. It is quite inexpensive, and therefore suitable for any amateur's pocket book, while at the same time a maximum degree of efficiency is secured by proper design of the various circuit elements.

Batteries Reverse Polarity at Low Temperature

When storage batteries or dry cells are cooled down to 170 degrees below zero Centigrade, the temperature of liquid air, these producers of electricity may reverse their voltage. This is the scientifically startling phenomenon that has been discovered at the Bureau of Standards, Department of Commerce, by two physicists, G. W. Vinal and F. W. Altrup, who were making tests to determine the reliability of batteries at arctic temperatures. So far as is known, this is the first time this phenomenon has been observed.

A storage cell of the same material as used on thousands of automobiles every day was gradually cooled down and the open circuit voltages at the various temperatures were determined. Down to 80 degrees below. the voltage remained at the normal value just as it

(Continued on page 47)

RADIS

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DURING the past few months the acute shortage of radio apparatus has prevented *any* radio dealer from adequately meeting his customers' needs. However, thru all the confusion, one fact becomes more clearly established daily: RADISCO is making better deliveries to its agencies than are obtainable from any other source.

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ry Performance"

Below is an illustration reproduced from an actual photograph showing a fully assembled, well equipped, efficient receiving station, and at the same time moderately priced. This set is made up of "RADISCO RECOMMENDED" *Apparatus, including Radisco variometers and coupler, grid condensers, Better "B" Batteries and all small parts. Also Corwin dials and switches, Murdock No. 56 phones and rheostats, A. R. Co. transformers and Station Type Vocaloud. This set may be assembled with parts sold by the Radisco dealers listed here.*

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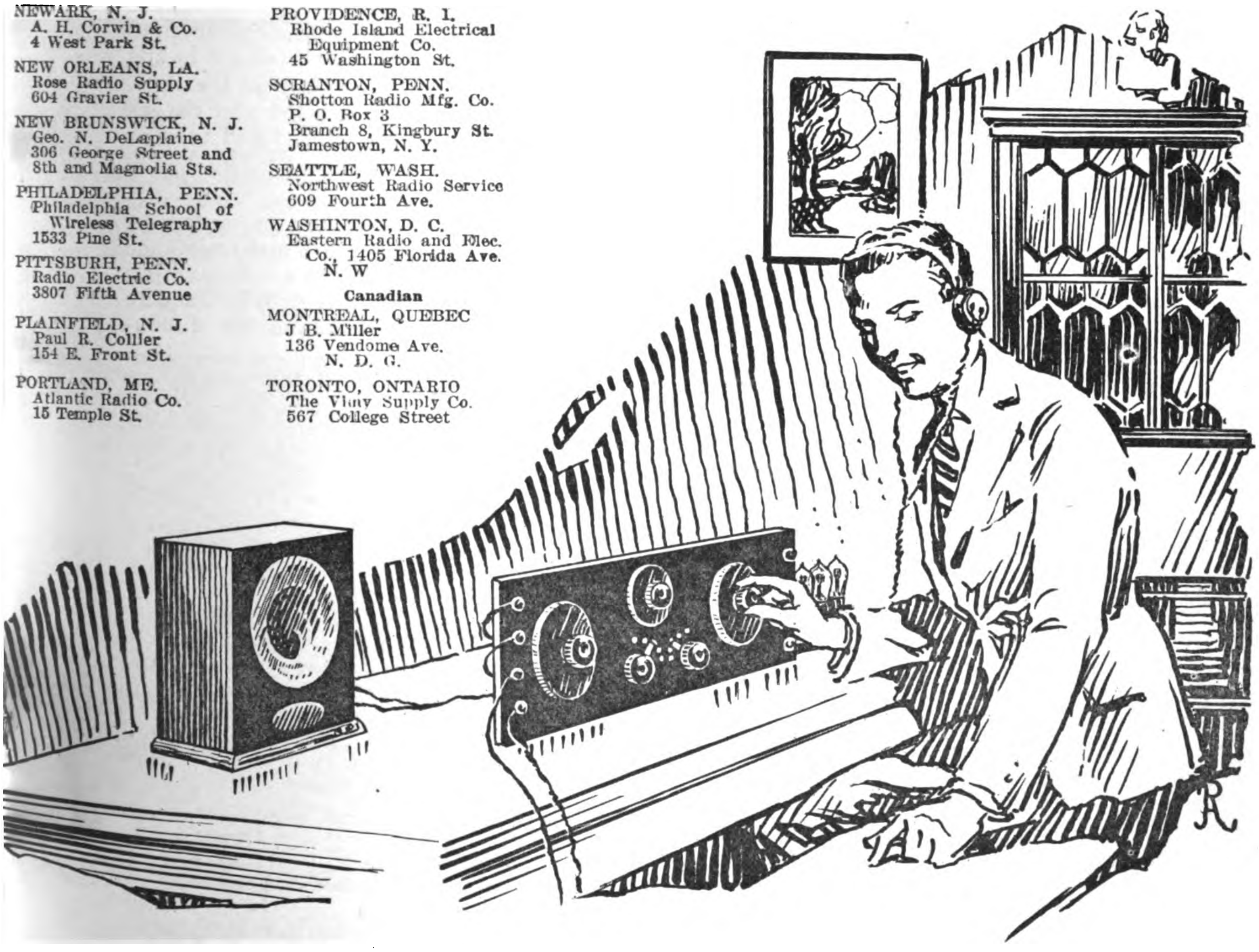


The Dimensions of Inductances

By C. M. Grabson

THERE appeared in the issue of The Wireless Age, June, 1921, an article on the above subject by Philip R. Coursey. Having occasion to design some inductances recently I used the method outlined in the mentioned article. It can safely be said that the method facilitates calculations considerably and is therefore a great time saver. It is also quite accurate for designing purposes.

However, as Mr. Coursey points out himself, it does not work out in practice that exact values will be obtained of the constants k_1 and k_2 as given in the table. It frequently happens that intermediate values are obtained. The tables for these constants, as given in the mentioned article, do not help much in such cases, and it is wasteful of time to interpolate from the tables. The suggestion of Mr. Coursey was therefore followed and curves were drawn showing the relationship between the constants k_1 and k_2 and the ratio of length of coil to diameter. These curves are here submitted for the benefit of other amateurs and experimenters in designing their coils.

In using these curves it must not be forgotten that the value of k_1 and k_2—as calculated by Mr. Coursey's method—must be multiplied by 10,000 before using the curves. To illustrate the use of the curves, where the table would be wasteful of time, consider the following design problem.

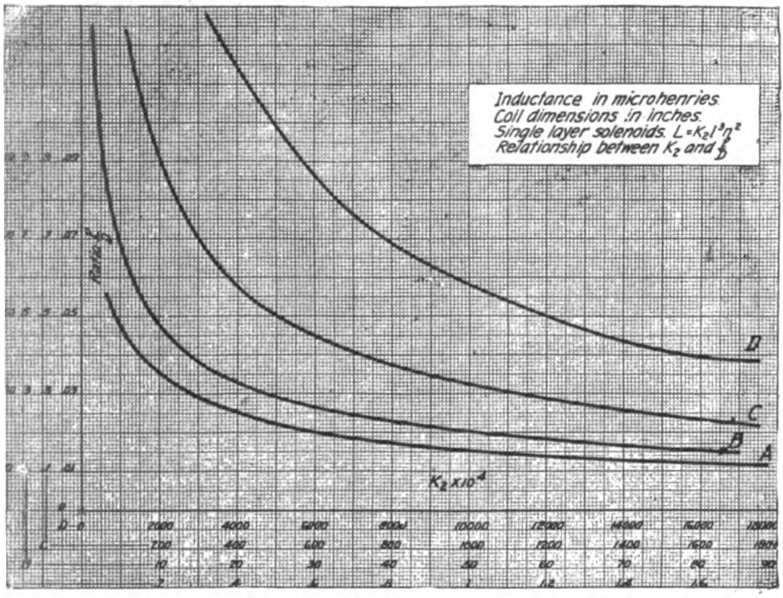


Figure 2

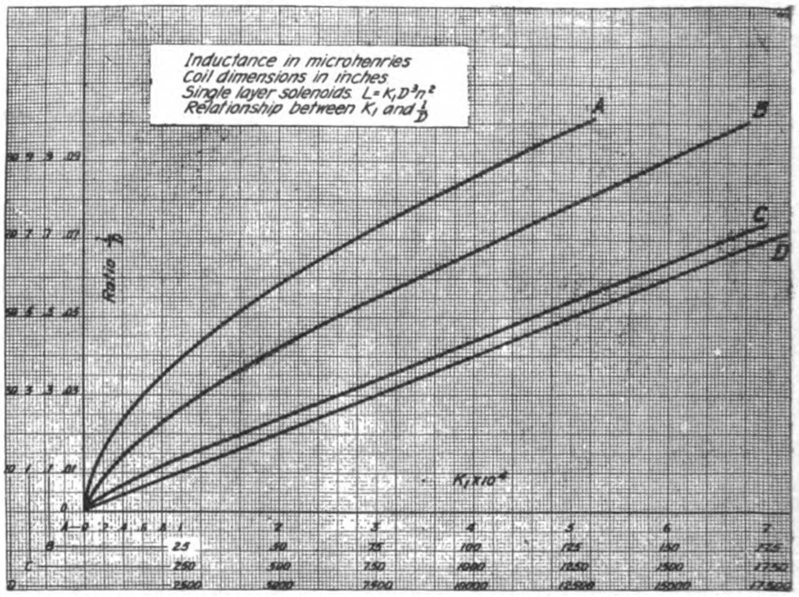


Figure 1

Graphs showing constructional dimensions of coils

An inductance of 2000 microhenries is required, for which a single layer solenoid is suitable. The permissible coil diameter is 4 inches, and conditions require the use of No. 22 D.C.C. wire. This size wire gives a winding of 30 turns per inch. From Mr. Coursey's formula

$$k^1 = \frac{L}{D^3n^2} = \frac{2000}{64\times900} = .0347\times10^4$$
$$=347$$

This value of k_1 is not in the table. However, from figure 1, we see that curve C covers this value. Looking up the value of k_1 equal to 347, we find that the curve C gives the corresponding value of 1.77 for the ratio $\frac{l}{D}$.

Therefore $l=4\times1.77=7.08''$ which is the length of the coil.

make $l=7''$

In a similar manner the curve giving the relationship between k_2 and $\frac{l}{D}$ is employed. It is obvious that this method is useful only for single layer solenoids. However other types of coils are frequently required and similar simple devices for designing would prove useful. One of the types of coil which is much in use is the so-called circular coil with square cross-section, the winding being a multiple layer one, as seen from the accompanying drawing. A simple method similar to the above for single layer coils has been described for the design of these square sectioned coils. This method is described by C. O. Gibbon in the July, 1920, Proceedings of the A. I. E. E., and the method and curves are here briefly reproduced for the benefit of the readers of The Wireless Age.

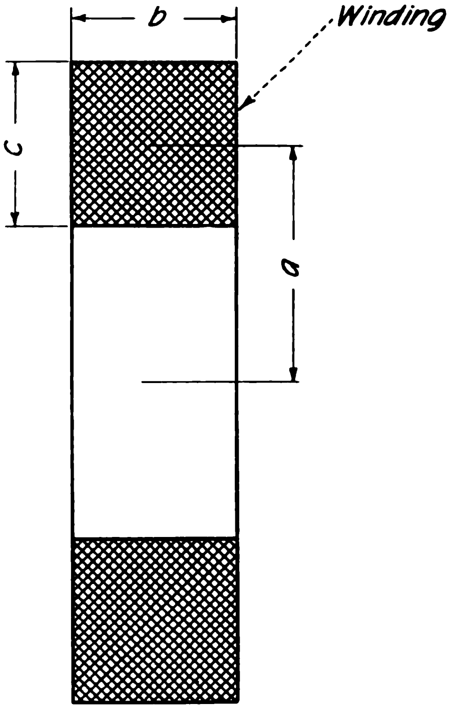


Figure 5—Coil design

The problem here presented is, given the inductance and resistance of the coil, to design a coil having a minimum weight. We require therefore to determine the dimensions of the coil, a, b, and c, and the number of turns in the winding. It is shown in the above-mentioned article that the most efficient coil for a given inductance and resistance will have a square winding—that is dimension b will equal dimension c, in figure 1. It is also shown that the inductance of such a coil in millihenries is given by the following formula

$$L = 18.85 \times 10^{-6} N^2 a \text{ mh.}$$

where, N = number of turns

b = c = 0.541a

a is the mean radius of coil

The two following equations are then derived, showing the relationship between L, R, W (weight) and dimensions of coil.

$$\frac{L}{R} = K = 0.368a^2 \qquad (1)$$

$$W = (\text{weight}) = 0.0772 \frac{L}{R} a \text{ lbs.} \qquad (2)$$

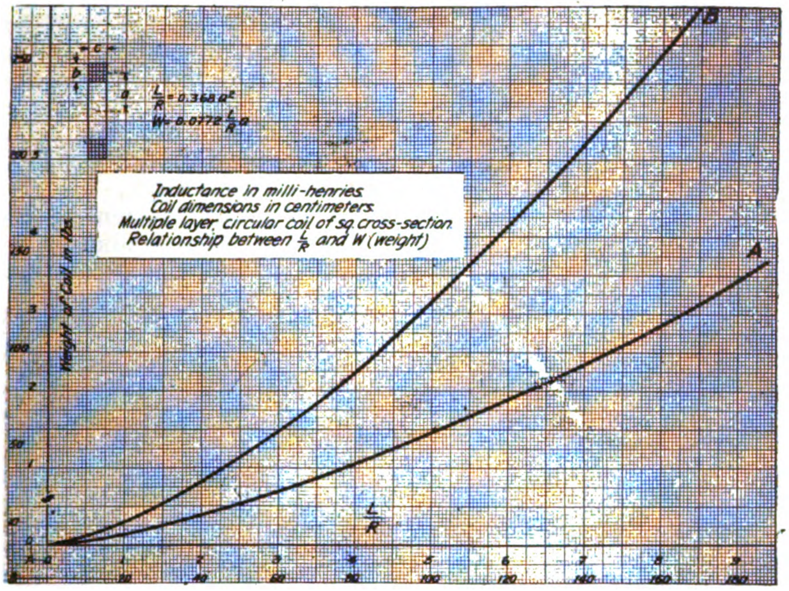


Figure 4—Graph for weight of coil in lbs.

Equations 1 and 2 enable curves to be plotted, from which the coil may be designed for any given inductance and resistance. These curves are here shown in figures 3 and 4. With the aid of these curves, and the following additional equations the complete coil may be designed. These additional equations are:

$$N = 230.3 \sqrt{\frac{L\,(\text{mh})}{a\,(\text{cms})}} \qquad (3)$$

Since the coil is of square cross-section

$$v = \sqrt{N} \qquad (4)$$

$$d = \frac{b}{v} \qquad (5)$$

where,

N is the number of turns in the coil
v is the number of turns per layer
d is the diameter of the wire to be used.

Suppose it is desired to design a multiple layer, square section, circular coil either for choking purposes, or for loading purposes, the required inductance being given and also the permissible resistance. The procedure for designing this coil would be as follows:

1. Knowing L and R, the value of $\frac{L}{R}$ is calculated and from figure 3 the coil dimension a is found corresponding to this value of $\frac{L}{R}$.
2. The winding dimensions b and c are then calculated from b = c = 0.541a.
3. The number of turns can now be found from equation (3) above.
4. The turns per layer is now calculated from equation (4).
5. The diameter of the wire to be used is obtained from equation (5).
6. The weight of the coil can be predetermined from figure 4.

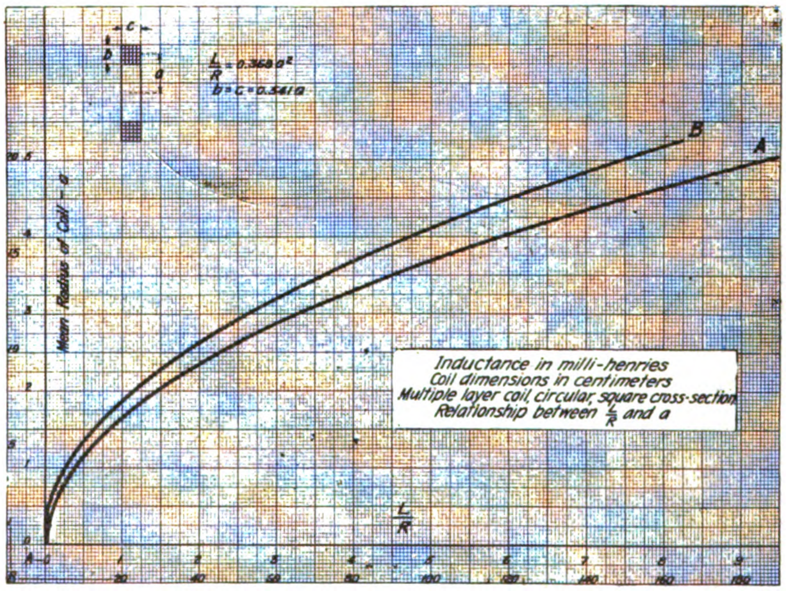


Figure 3—Graph for mean radius of coil

Problem: It is required to design a loading coil of 15 millihenries, the allowable resistance being 7 ohms. The coil is to be light, compact and occupy a minimum of space. The multi-layer, square-section, circular coil is suitable for this.

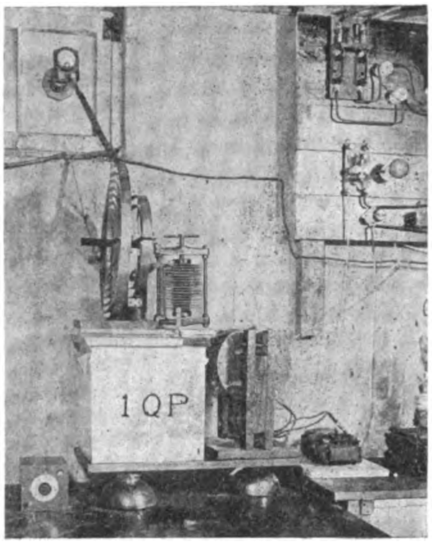
1. L = 15 mh, and R = 7 ohms. Therefore $\frac{L}{R}$ — 2.14.
2. From figure 3 we find that corresponding to $\frac{L}{R} = 2.14$, a = 2.2 cms. b = c = 0.541 × a = 1.19 cms. The winding dimensions are therefore 1.19 cms. square.
3. The number of turns in the coil are found from equation 3 as $N = 230.3 \sqrt{\frac{L}{a}} = 230.3 \sqrt{\frac{15}{2.2}} = 608$ turns.
4. The turns per layer are $\sqrt{608} = 24.6$ turns. Take the nearest whole number, making the turns per layer 25 turns.
5. The diameter of wire is given by $\frac{b}{v}$ and is $\frac{1.19}{25} = 0.0475$ cms. This gives a winding of 53 turns per inch, for which No. 29 D.C.C. wire is found suitable from tables.
6. The value of $\frac{L}{R}$ being 2.14, by using figure 4, curve A, we see that the weight of the coil corresponding to this value is 0.4 lb.

It will be evident that when other conditions and values are given, by the same use of these formulas and curves the other design data may be worked out. These curves are sufficiently accurate for design and engineering purposes and it is recommended that they be used in coil design as time and labor-saving devices.

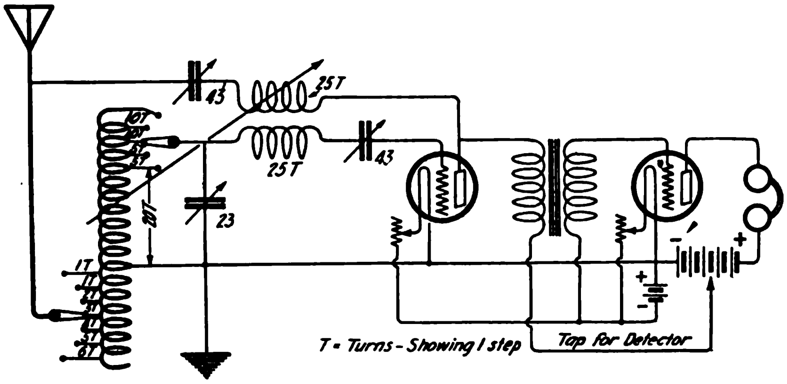
1QP An Active Station

THE amateur radio station of John Reinartz, 371 Hartford Road, South Manchester, Conn., Call 1QP (formerly 1XT), is one which is well known to the amateurs of the Eastern part of the country.

The design of station 1QP necessitated noiseless operation, hence the reason for the quenched gap. During the nearly two years of operation the quenched gap has been tried on both very low, i. e., 30-cycle note and very high 1,000-cycle note, the first giving 2 amperes and the latter giving 9 amperes radiation. Either tone, however, is very pretty and the DX quality of both is about the same, being reported by fourth district stations as very good, the low note being mistaken for 60-cycle C. W. at times. Both tones will be used at times this winter and reports on the signals of 1QP will be appreciated.



Quenched gap transmitter



Hook-up of receiver

The receiver of 1QP is of new design, primarily for C. W. reception, but is as good for spark as most three-circuit receivers, all districts but the 6th and 7th having been copied with it, numbering 450 for the past winter.

For the benefit of those desiring to try this hook-up it is shown below:

The aerial at 1QP is of six wires, No. 6 B. & S. gauge aluminum, separation two feet, 75 feet long and flat top, 65 feet high at far end and 35 feet high at near end. The wires are continuous, without joints, to change-over switch.

The ground system is composed of several wires radiating from the secondary of the oscillation transformer over the ground under the entire aerial and also of buried wires and pipes, and the water and gas piping in the house.

Receiving set at 1QP

A Very Simple Radiophone

MANY amateurs would like to construct small radiophones, but the numerous instruments that are used confuse them and they are afraid to build one for fear it will not work. I have built a set that is the last word in simplicity. It is very efficient and with 60 volts on the plate, will cover 5 miles very easily. I have been heard at a distance of 20 miles. A circuit diagram of the set is given in figure 1.

The inductance consists of a cardboard tube 2 inches in diameter wound with 36 turns of number 16 D.C.C. wire. The wire should be wound from one end (A) and at the 19th turn a tap off (B). Seventeen more turns should be wound to make 36 turns in all. The variable condenser in shunt to the inductance has a capacity of .0005 mfd. The plate potential can be composed of three ordinary "B" batteries connected in series, but if a few more are used, so much the better. The tap (B) is connected to the positive side of the filament lighting battery. A key can be connected in this lead as shown in the diagram for continuous wave telegraphy. When using the set as a radiophone, this key must be closed. A microphone of the common land telephone type, which can be purchased very cheaply, is connected in the ground lead. Altogether this set is very simple to construct and is always reliable and stable in

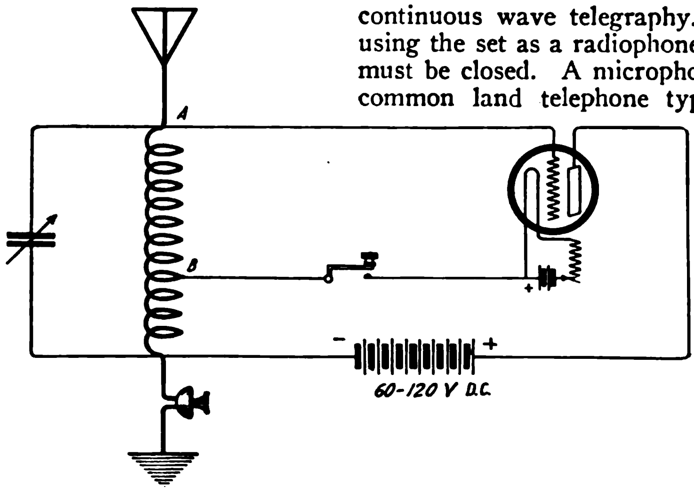


Figure 1—Circuit diagram of a simple CW transmitter

Portable Radio Set

THE type of apparatus to be employed in any portable radio receiving set is determined by facilities for transportation and the range to be covered. The usual practise is to use crystal detectors, principally because of their simplicity and light weight, but their use necessitates a large aerial which is not only heavy but adds to the difficulty of erecting the station. In view of the fact that a portable aerial is at best a makeshift it becomes necessary to use the most sensitive detector obtainable to work over an appreciable range.

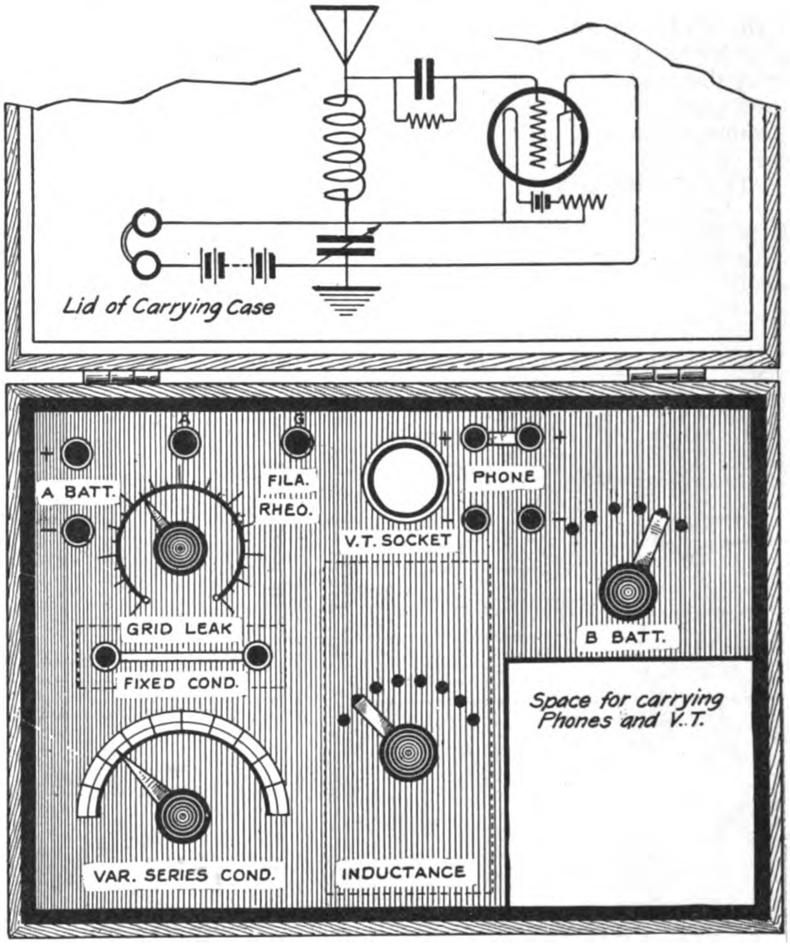
It will be apparent that the vacuum tube is the solution of the problem and in spite of the batteries necessary to operate it the complete set will be but slightly heavier than a crystal set on account of the small aerial necessary.

The set described employs a vacuum tube detector, and is extremely simple as regards tuning apparatus, but it gives a range of wave-lengths up to 3,000 meters with sharp tuning. It is complete in itself with the exception of the filament battery which may consist of dry cells or a small storage battery.

The illustrations show the assembly of the set. The containing case is a small fibre suitcase, measuring 14 by 12 by 5 inches outside. The body of the case is four inches deep and encloses a tuning and B battery box. The lid, being one inch deep, forms a handy place to carry the aerial wire. The tuning apparatus and detector bulb are mounted in a small box that fits into the case, its width being about two-thirds the length of the case. By so mounting the instruments they can be readily removed from the case and used in the home station, permitting the case to be used for other purposes.

The circuit used is the single slide tuner, series condenser feed back. The inductance consists of 550 turns of No. 22 S.S.C. wire wound on a tube 8 inches long and 3 inches in diameter. The winding is banked in two layers and tapped to an eight point switch at the following turns —40, 70, 120, 180, 250, 350, 450, 550. The condenser has a maximum capacity of .001 mfd. The location of capacity and inductance are shown in the illustration.

A socket is mounted flush in the panel to take the vacuum tube. A rheostat controls the filament current as shown. The usual grid condenser provided with an adjustable grid leak is mounted as shown by the dotted lines, the leak should be carefully adjusted when the set is assembled to get maximum signal strength. This completes the apparatus proper, six binding posts being provided to connect aerial, ground, A and B batteries.



The portable radio set assembled

The B battery is mounted in another small box and consists of two 22½ V. units connected to a multipoint switch on the box to permit of voltage control when a soft tube is used. Two binding posts on this box permit it being connected to the tuner and detector. It will be noted that a short jumper connects one terminal of the B battery to the tuning box, the phones being connected across the other two to complete the circuit. Disconnecting the phones while the set is not in use reduces the likelihood of a short on the cells during transportation.

The tuning and battery boxes are held in place in the case by short wood screws driven in from the outside. The remaining space in the case is occupied by the phones. The tube is to be removed and placed in a small box with cotton and packed with the phones when the set is not in use. The wiring diagram is well known for its ease of adjustment, selectivity, and regenerative effect. The feed back is due to the series condenser and can be readily controlled.

The aerial should be about 200 feet of No. 18 D. C. wire which can be rolled into a coil and tied with cord and fitted into the lid. For the filament three dry cells or a small storage battery are necessary and must be carried separate. Dry cells are entirely practical if the set is in use for short periods only.

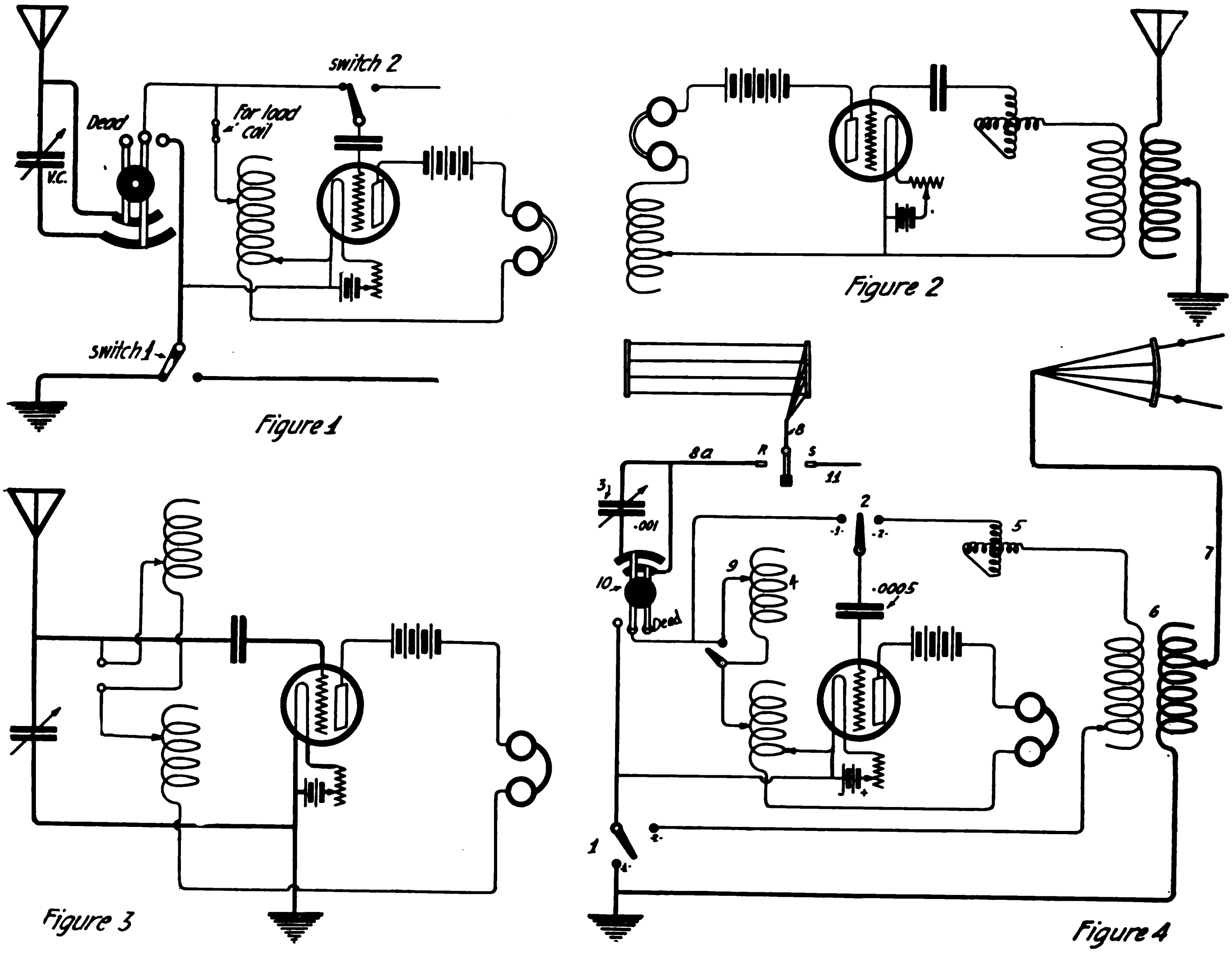
This outfit will meet the requirements of any camp or outing and after the trip is over the instruments can be removed from the case and set up in the permanent station. The tuner will be found sufficiently selective to deserve constant use and will often be preferred to the more complicated sets.

A Short, Medium and Long Wave Receiver

By E. T. Jones

NO doubt, many experimenters have arrived at the conclusion that the receiver described by me in the December, 1920, issue of THE WIRELESS AGE has lived up to its name under all conditions. For the benefit of readers who did not see the article referred to a brief summary will be given. The tuning coil is nothing more than a double slide tuner. The antenna connection goes directly to one slider and to the grid through the grid condenser. The remaining slider connects to the negative side of the vacuum tube filament. The bottom portion of the winding has its end connected to one side of the telephone receivers and then to the ground. The remainder of the plate circuit is the same as the standard practice.

Inductance load coil



Various circuits for short, medium and long wave reception

For short wave reception, i.e., any wavelength below 1000 meters, a variable condenser is placed in series with the antenna, and for reception of signals on wavelengths in excess of 1000 meters, the condenser is shunted across the secondary tuning side.

Several changes have been made in the circuit over the one described in the December, 1920, issue. It was found that the signal audibility was increased 20 per cent. with the variable condenser in series with the antenna instead of in series with the ground. Furthermore, that it was best to connect the ground to the filament in preference to the plate-inductance connection. The variable condenser is now shunted across the aerial and ground with the ground to the filament. See figure 1 for the latest connection with all the improvements. Particular attention should be given the series-shunt switch. This switch is much more simple in construction and operation than most types.

SHORT WAVE RECEIVER

A vario-coupler was constructed along the usual lines and in addition an ordinary variometer was connected in the circuit with the medium wave receiver so that the tuning inductance acts as the plate variometer. Note that the same tube, A and B batteries and 'phones are employed in both circuits for the same purpose.

The switch No. 2 throws the grid and its condenser in either the short or medium wave circuit. See figure 2 for short wave receiver, which is connected to a small antenna. Switch No.

1 throws the ground connection off the filament and places the filament to the tuning side of the short wave receiver.

Tuning of the plate circuit is accomplished by increasing or decreasing the inductance in that circuit which is the same inductance employed in the medium and long wave circuit. Maximum strength of signal is brought about by adjusting the variometer in the tuning circuit.

With the switches in their right position the medium wave receiver is the same as that shown in figure 1.

Long Wave Receiver

The large inductance load coil is so arranged to act as though it were on the same tube as the medium wave coil. Since it is in the plane of the coil in the box (both are vertically aligned), maximum results are obtained. The long wave circuit is shown in figure 3.

It can be seen that this is a very favorable arrangement in that it permits the use of one tube and its ordinary accessories to function in three different circuits without the need of several vacuum tubes and their control units.

Those of you who constructed the medium wave tuner described in the December issue of The Wireless Age should not hesitate to install these very necessary and useful additions. Figure 4 gives the entire circuit.

A New Type of Coupler for Short Waves

By Geo. A. Grogan

After considerable experimenting with various inductances for short wave reception I have designed a coupler similar in looks to the vario-coupler so familiar in regenerative sets. Variometers are not necessary for sharp tuning with this coupler, but may be used if desired.

The primary consists of a tube (cardboard or fibre may be used) four and one-half inches in diameter and five inches high, wound with sixty-four turns of No. 26 B.&S. gauge D.C.C. magnet wire. The winding is begun one-half inch from the top of the tube and 36 turns are wound. Then a space of one inch is left between the two groups of winding. In the center of this space a hole is drilled for the rod, which varies the rotor, see figure 1.

Any size rod may be used, but a one-fourth inch rod is best as it fits most dials on the market. Six taps are taken off the primary, three from each section of the winding. They may be taken off at every twelve turns. When the second section of winding is finished there is a space of one inch remaining. This will serve to bring the hole for the rotor shaft near the top of the panel and leave room for the primary switch. After winding, the primary is given a coat of orange shellac. The primary is now complete and the leads at the taps are scraped to get rid of the insulation.

The rotor form may be purchased from any of the large radio supply houses for about one dollar. A hole is drilled in the center of the rotor for the shaft. The rotor may be boiled in paraffine or shellac before winding. One half on the rotor is wound with twenty-four turns of No. 20 B.&S. D.C.C. magnet wire. This is the tickler which has two leads going to the binding posts on the panel and should be about five inches long. The secondary leads should be about the same length. The secondary is wound on the other half of the rotor with forty strands of No. 28 B.&S. S.C.C. magnet wire. After winding the rotor should be given a coat of shellac and allowed to dry after which the rod is inserted to fit the rotor tightly. The winding is now finished and the instrument ready for mounting.

An oak base 5½ x 6½ x ½ inches is then secured. This may be stained or shellacked as the constructor desires.

A panel, preferably bakelite, 5½ x 6½ x 3/16 inches is purchased. It may be grained with oil and sandpaper to make a good appearance. A ¼ inch hole for the shaft is drilled two inches from the top and three and one quarter inches from the sides. In the low-

(Continued on page 47)

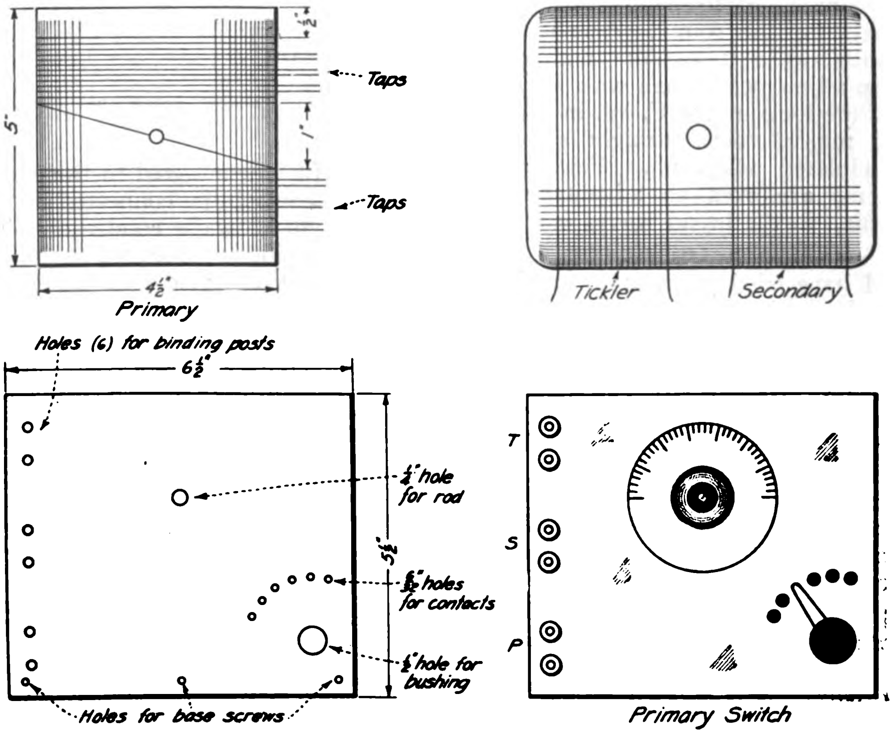


Figure 1—Constructional details of the vario-coupler

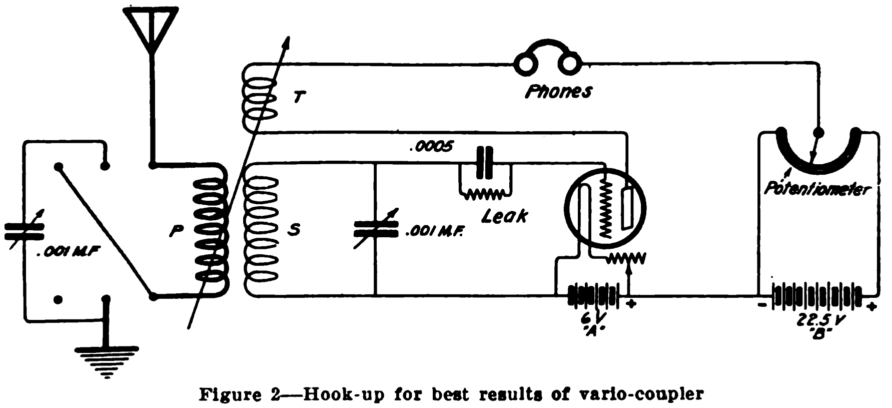


Figure 2—Hook-up for best results of vario-coupler

A Hook-Up That Simplifies Tuning

By F. C. Greenwald

I HAVE noticed beginners hereabouts using home-made or purchased apparatus embodying the usual aerial short wave condenser, a loose coupling arrangement between primary and secondary, a secondary condenser, a grid condenser, usually adjustable, and a bridging adjustable condenser. All these with the standard adjustable filament rheostat make a total of five adjustments necessary where tuning or attempting to tune in when receiving. Some few are using the Armstrong arrangement with variometers, which appears to be a very efficient circuit, but also entails a multiplicity of adjustments during use. An operator's time is in immediate demand, copying messages, and the less time necessary to spend on adjustment, the better, all round. Also it is very much easier to explore with one or two adjustments, than with five, when on the lookout for C. W. in the form of music, voice, straight or buzzer modulated telegraph. Few adjustments are even an advantage when tuning in the broad waves emitted by the spark sets.

I have tried out a great number of receiving circuits, capacity coupled, inductively coupled, and conductively coupled, combined primary and secondary, separate primary and secondary with and without secondary condenser, tuned and untuned grid circuit, adjustable bridging condenser in plate circuit, and variometer in the plate circuit, and variometers in grid and plate circuits as connected to the vacuum tube.

I was led to believe that from a standpoint of both simplicity and efficiency a vacuum tube should be connected to only a grid circuit and a plate circuit, each arranged to tune to the other and the aerial should be connected directly to the grid or plate circuit through a condenser, if necessary, whether into the grid or plate circuit depending entirely upon its use as a receiving circuit or as a transmitting arrangement. The diagram figure 1 will make this clear. I use only one inductance coil tapped at or near the center. I found it convenient to use a pasteboard tube 3 inches in diameter 1½ inches long on which was wound 22 turns of No. 26 B. & S. double covered cotton insulated wire, a tap taken off by twisting a loop in the wire after renewing the insulating and then continuing to wind in the same direction for 22 more turns, making a total of 44 turns. The middle tap of this coil was connected to ground, one end connected to one side of a .001 mfd. variable condenser, the other side of the condenser being connected to an indoor aerial. This aerial is a single wire, extending from basement to loft, about twenty-five feet high and perhaps twenty feet long in the loft of the building. One side of a fixed small capacity condenser, .0003 to .0007 mfd. is connected to the end of the coil, which is connected to the variable short wave condenser. The remaining side is connected to the grid of the tube, the grid leak being connected across the grid condenser. I use a variable grid leak, as I find each tube requires a somewhat different grid leak. The other end of the coil is attached to the plate. The telephone and "B" battery are in series and extend from the negative side of the "A" battery to the ground tap at approximately the middle point of the coil. Perhaps it may be necessary when setting up this circuit and tuning the aerial to remove or add a few turns to the grid end of the coil. For the average amateur aerial twenty-two turns will be about the correct value, as the adjustable condensers allow considerable range in tuning. The condenser indicated in broken lines merely indicates the theoretical condenser caused by the proximity of the wires leading to the head set and which have a very practical value. It is not necessary to place an actual condenser at this point, as the usual receiver cord provides this.

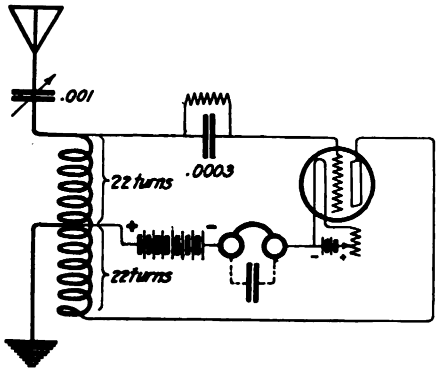


Figure 1—Receiving circuit that simplifies tuning

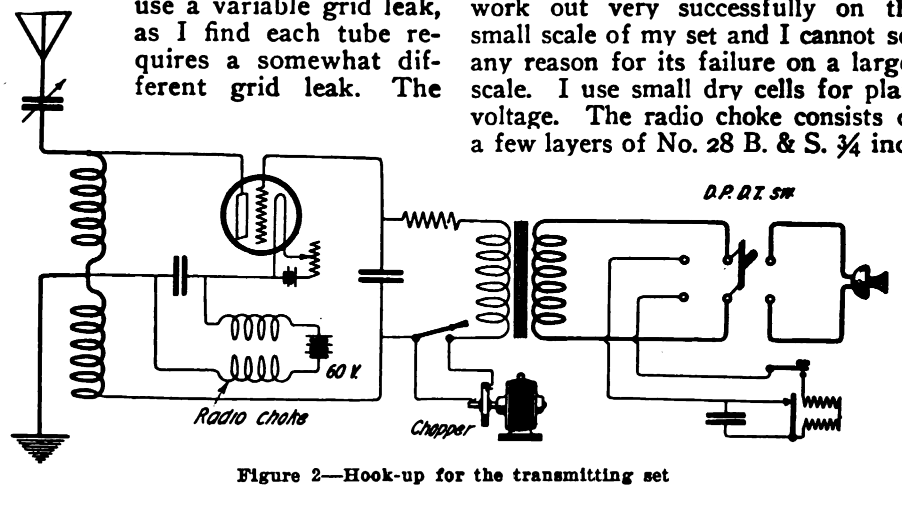


Figure 2—Hook-up for the transmitting set

In operation it is found advisable to bring the filament brightness to a point where the tube oscillates with a squeal or howl or at least exhibits a state of liveliness, with the short wave condenser setting at zero. When this condition is established exploring is in order by moving the condenser pointer over the scale until the best point of audibility of signals is reached. When this position is found, bring up the filament brightness until the tube oscillates at this point and then back off a trifle. Only two adjustments are needed, the short wave condenser and the filament rheostat, against four or five in other arrangements. It is quite possible with a loose coupled set to get a nearby spark transmitter much louder than with this simple outfit, but we should realize the weak distant signal must be catered to rather than the nearby stone crusher.

Figure 2 embodies the same idea used in the single receiving set applied to the transmission set. It appears to work out very successfully on the small scale of my set and I cannot see any reason for its failure on a larger scale. I use small dry cells for plate voltage. The radio choke consists of a few layers of No. 28 B. & S. ¾ inch diameter 1½ inches long and is used to prevent the battery from short circuiting the condenser by radio frequency current. The telephone, buzzer and chopper arrangement in the grid arrangement in the grid modulation scheme are conventional and need not be described, being illustrated freely on standard phone circuits.

Amateurs of limited means will find these two circuits to their liking, the coils can be made easily in the ordinary workshop. An old type Ford coil makes a good modulation transformer for the transmission hook-up. A simple arrangement for phone work

(Continued on page 48)

The Monthly Service Bulletin of the

NATIONAL AMATEUR WIRELESS ASSOCIATION

Guglielmo Marconi *President* | **J. Andrew White** *Acting President* | **H. L. Welker** *Secretary*

Founded to promote the best interest of radio communication among wireless amateurs in America

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HEADQUARTERS: 326 BROADWAY, NEW YORK

THE Department of Commerce has received so many complaints from owners of receiving sets regarding the great amount of broadcasting of music, speech, unofficial news items, and other matter being done by amateur stations which interfere with the reception of the programs of the regular commercial broadcasting stations.

As a result of these complaints the Department of Commerce made an extensive investigation and the result is that it has been decided to amend the radio laws and regulations of the United States governing amateur radio station operation by the addition of the following which will hereafter be incorporated in all amateur station licenses:

"This station is not licensed to broadcast weather reports, market reports, music, concerts, speeches, news, or similar information or entertainments."

As above stated, this ruling applies to all general and restricted amateur radio stations.

The order prohibiting the broadcasting of general and restricted amateur radio stations in the United States, was signed by C. H. Huston assistant secretary of Commerce and becomes effective at once.

Δ Δ

THE Cedar Rapids Radio Club of Iowa was organized December 6 at Coe College, for the purpose of regulating traffic and promote fellowship among the amateurs in this locality. An invitation is extended to those interested in radio to attend the meetings of the club which are held on the first and third Tuesdays of every month at the Chamber of Commerce building. The officers are president, M. Jenning; vice-president, Charles Boegel; secretary, Lester MacMellon; treasurer, George Keppel.

Δ Δ

THE call letters of Burton P. Williams' station, 3220 Orlean street, Pittsburgh, Pa., have been changed from 8ZD to 8ZAE.

Δ Δ

THE second annual amateur radio convention-exhibition of the Executive Radio Council, Second District, will be held at the Pennsylvania Hotel, New York on March 7-11, 1922.

The glass-enclosed roof garden of the hotel will be the exhibit hall, and the adjoining Butterfly Room the lecture hall, with adequate seating capacity. Only papers of vital interest to amateurs will be presented.

The convention and exhibition will open at 7 p. m., March 7, and will be open from 2 p. m. to 11 p. m. on the following days. A season badge will be sold at the door 50 cents, covering the five days. One time admissions 25 cents.

A banquet for everybody, male and female, will be held on the night of the 11th (Saturday).

That dusky-hued girl who was the sensation of last year's dinner will be there again to demonstrate the last gasp in Hawaiian grass costumes. All male guests will be searched at the door for concealed lawnmowers.

The banquet charge will be $4.00. The number which can be accommodated is limited to 600. Tickets will be allotted up to this number only, in the order in which applications are received. Applications by mail should be made to John Di Blasi, 6 Warren Street, New York.

Δ Δ

THE inaugural meeting of the "Cape Breton Amateur Radio Association took place on December 21 at the home of G. A. Edwards, North Sydney, Nova Scotia, and was well attended by representative amateurs from Sydney, Sydney Mines and North Sydney.

It was decided that the association should include the whole of Cape Breton Island, with local branches in each town. The constitution was drawn up and officers were elected for the first period of six months dating from January 1 to June 30, 1922.

The objects of the association are the organization and advancement of radio amateurs within the island of Cape Breton. Particular stress is being laid upon the question of interference both with commercial and amateur stations; and with this object in view the members have decided to install and use C.W. transmission as far as possible. Traffic rules are to be drawn up and routine hours for working and experimenting will be arranged.

The officers elected to serve for the first six months are: President, G. A. Edwards, North Sydney (1 AW); Sydney Vice-President, G. D. Crowell (1 BM); North Sydney Vice-President, M. J. Cleary; Sydney Mines Vice-President, S. Jones (1 AJ). For the present the vice-presidents will act as secretary-treasurers and traffic supervisors for their respective districts and the president will undertake the duties of general secretary.

Correspondence is invited from other amateur organizations. Information will gladly be given regarding membership and regulations to those interested.

Δ Δ

THE first meeting of radio enthusiasts in Porto Rico was held at the Carnegie Library at San Juan, P. R., on December 25, which resulted in the organization of a radio club to be known as the Porto Rico Radio Club. The following Board of Directors was elected for the term of one year: Joaquin Augusty, President; Jesus T. Pinero, Vice-President; Jose T. Maduro, Secretary-Treasurer; Enrique Camunas and Alberto P. Graham. The above members hold first class amateur licenses and Mr. Camunas holds a commercial license.

A LONG, unpainted and hence unsightly pole raised recently in Midwood Manor, Brooklyn, N. Y., stirred up a clamor of protest and the cry of "nuisance," has unexpectedly been turned into a community blessing, according to Gaston Koch, president of the Midwood Manor Association, who was the official buffer of the protests. Mr. Koch, directed by a number of indignant fingers, went to 967 E. 10th street, where he found the offensive pole planted in the back yard. Charles C. Cahn, a new resident of the community, proved to be the owner of the pole. He confided to Mr. Koch that his one big hobby was radio, and that he had a pleasant surprise for his neighbors. The pole, he said, was to hold up aerials for a private plant which would not only afford him pleasure but, that of all Midwood. It would be painted, too, and made to blend harmoniously with its environs.

He said he had made arrangements with people in charge to hear a series of concerts to be given by Metropolitan Opera stars beginning in January. If everybody was agreed he would place his receiving apparatus with an amplifier and Magnavox in the auditorium of Public School No. 99, where all Midwood can assemble and enjoy the best music that can be heard. Mr. Koch, at a meeting of the Midwood Manor Association, announced these tidings. Also that Mr. Cahn had offered his service as radio instructor to the Boy and Girl Scouts of Midwood.

Δ Δ

THE Scott High School Radio Club of Toledo, Ohio, held an "open meeting" at the school recently and entertained the parents and friends of the members. A special antenna and sensitive receiving apparatus were used to receive radiophone music and speeches from Pittsburgh, Detroit and other points where radiophone broadcasting stations are located.

The meeting was in charge of Robert Tiedeman, the club's president. Among the speakers were J. W. B. Foley, radio instructor of Scott High, and Edward Featherstone, another member of the school's faculty.

Δ Δ

AT a recent meeting of the Hudson City Radio Club, Inc., held at the headquarters, 37-41 Sherman avenue, New Jersey, Robert Lange, August Heins and Frank Eichinger were admitted into membership. Nineteen members are on the roster of the club at present and it is expected that ten more will be added at the next meeting. The club has installed a one-half K.W. spark set, a rectifier for charging the members' batteries, a two-step amplifier and a radiophone set station, call 2CBK. A code practising table has also been a recent addition. The public is invited to inspect and listen through the wireless phone at the office of Mr. Bremer, 89-91 Franklin street, between 8 and 10 p. m. Application for membership may also be had from Mr. Bremer.

EITHER the attempts of certain commercial interests to advance the science of radio by broadcasting concerts, lectures and other matters through the ether must suffer interminably or else amateur operators may face cancellation of their licenses to have sending stations unless interference in wireless telephone traffic is soon stopped, according to Walter Butterworth, Government radio inspector for the First District, who addressed the Radio Council of Southern New England at its meeting and dinner in the Providence Plantations Club.

Mr. Butterworth outlined the problem which now seems to present an obstacle to the conducting of further experiments tending to increase the value of radio. He explained that the United States and Canadian Governments are the only ones in the world which allow other than professional operators to send messages, and in view of this fact had specified that wavelengths of no more than 200 meters should be used by amateurs.

Commercial enterprises are now sending abroad between the hours of 8 and 10 every evening weather reports, musicales, addresses and other things calculated to excite a greater interest in the possibilities and the actualities of the wireless telephone. The project has been handicapped, however, by amateur telegraphers, who have not tuned their instruments within the limit set by the Government, and interfere with the telephone waves.

Receiving stations, whether telegraph or telephone, do not require licenses, but permits must be obtained by sending stations.

Mr. Butterworth urged his hearers not only to tune their instruments properly, but when possible to refrain from sending messages during the telephone broadcasting period, between 8 and 10 o'clock at night, in order to reduce the danger of cancellation of licenses. The speaker revealed that there are now 3,000 licensed radio transmitting stations in New England, which is three times as many as existed before the war.

For the benefit of the science as a whole, Mr. Butterworth besought his hearers to co-operate to the best of their ability with the Government in its efforts to regulate wireless activities, that all branches may be allowed a maximum opportunity for beneficial development.

The Radio Council of Southern New England was formed last spring and so far has held three meetings, all of which have been well attended by amateurs and students of radio from Rhode Island and Massachusetts. The purpose of the group is to stimulate interest in the topic in this section of the country and to work to the advantage of the art from a non-commercial standpoint. Another aim is to bring together at regular intervals persons who otherwise would know each other only through aerial messages. The organization is open to members of both sexes.

Included in the plan of organization is a vigilance committee, by which the council will keep watch over its own members and will receive and adjust complaints as to willful interference, illegal use of transmitters and the use of illegal wavelengths, and will also report such cases to the district radio inspector when necessary.

Δ Δ

A MEETING of the Hudson County Radio Club, New Jersey, held at the Standfast Club, entertained Mr. Ranger, Engineer of Radio Corporation, who delivered a lecture to the members. The talk was highly interesting.

The Hudson County Radio Club holds semi-annual meetings in the Standfast Club, and all interested in radio work are invited to join. The officers are: Gaylord Smith, 2746 Boulevard, president; T. W. Cooper, vice-president; H. Silbersdorff, treasurer; J. A. Erhard, secretary; P. H. Rank, assistant secretary; F. V. Bremer, traffic manager. Executive committee—William Michel, Paul Wandelt and Paul Zeyn.

Δ Δ

A RADIO Club has been formed at South High School, Broadway and Fullerton avenue, Cleveland, Ohio. Five girls are included among the seventeen members.

Prize Contest Announcement

The subject for the new prize contest of our year-round series is:

MODULATION SYSTEM

CLOSING DATE :: :: MARCH 1, 1922

Contestants are requested to submit articles at the earliest practical date.

Prize winning articles will appear in the May, 1922, issue.

All manuscripts should be addressed to the CONTEST EDITOR OF THE WIRELESS AGE.

The best type of modulation system to use with a moderate power tube transmitter either with or without modulation tubes. Data to include details necessary to construct complete transmitter.

PRIZE CONTEST CONDITIONS—Manuscripts on the subject announced above are judged by the Editors of THE WIRELESS AGE from the viewpoint of the ingeniousness of the idea presented, its practicability and general utility, originality and clearness in description. Literary ability is not needed, but neatness in manuscript and drawing is taken into account. Finished drawings are not required, sketches will do. Contest is open to everybody. The closing date is given in the above announcement. THE WIRELESS AGE will award the following prizes: First Prize, $10.00: Second Prize, $5.00; Third Prize, $3.00, in addition to the regular space rate paid for technical articles.

Every member of the club will be able to receive 12 and send 10 words a minute by the end of the term, says Grover Muthersbaugh, instructor.

Δ Δ

THE Stevens "Tech" Radio Club of Hoboken, N. J., has outlined an ambitious program for the year. The first item is a trip to Port Jefferson, L. I., to inspect the largest radio station in the world. The trip was arranged by a Stevens man connected with the gigantic project and is limited to a few members of the club.

To give the beginners instruction in wireless, the club has installed a small receiving set in the radio room, the new installation saving the larger and more expensive set from possible damage by inexperienced hands. Another improvement made by the club is that the aerial, instead of being stretched diagonally across the court of the Navy building is now directly across it, enabling them to obtain greater height.

A loud-speaker was recently installed and a radiophone sending apparatus is to be purchased as an adjunct to the powerful telegraphic radio transmitter now possessed by the club. Messages are sent for students within a radius of 250 miles.

Δ Δ

ARRANGEMENTS have been made for the St. Clair County Radio Association, with headquarters in the Sexton Building, Main street and Division avenue, East St. Louis, to use the wireless equipment of the Boy Scouts in East St. Louis. Classes in advanced instruction will be held. Jerome Hartmann and Arthur Beckwith, senior operators, will be in charge.

Δ Δ

WIRELESS telegraph operators and those having telephone equipment are planning to form a club in Martinsburg, W. Va., and those who are known to have such equipment as to make them eligible have been advised of the project.

Operators who are interested are asked to communicate with Mr. Burns, West John street.

Δ Δ

JOHN F. O'NEILL, director of Knights of Columbus Free Evening School for ex-service men, announces a new class in wireless telegraphy and telephony will be formed at the Hut, 601 Newark avenue, Jersey City. Any ex-service man who desires to secure a thorough training in radio subjects is privileged to enroll.

In addition to the class now forming sessions of an advanced class will be continued. Both classes will meet Tuesday and Thursday evenings at 7.30.

Δ Δ

A WIRELESS telephone has been installed in the electrical shop of Victor Werner, at Catalpa avenue and Fresh Pond road, Ridgewood, L. I.

The device has excited the wonder of the residents of the section, who gather at the shop daily to hear concerts transmitted from all over the country, particularly from the Westinghouse Manufacturing Company of Newark, N. J., from which point prominent artists are heard clearly, without the aid of an amplifier.

On one occasion, a customer who saw the horn and heard the sound of music issuing, thought it to be a phonograph. After hearing several selections played without the machine being attended to, she asked, "How many songs does that record hold?"

(Continued on page 46)

STATIONS WORKED AND HEARD

Stations worked should be enclosed in brackets. All monthly lists of distant stations worked and heard which are received by the 10th of each month will be published in the next month's issue. For example, lists received by November 10th will be published in the December issue. Spark and C. W. stations should be arranged in separate groups.

2OM, F. B. OSTMAN, 180 Broad St., Ridgewood, N. J. (November and December).

Spark.—1ACK, (1ADC), (1ADL), (1AEV), (1AHF), 1AIT, (1AKG), (1AMD), (1APO), 1ARY, (1ASF), 1ASW, 1ASZ, (1AW), 1AWM, 1AWO, (1AZK), (1BDC), 1BDI, (1BDT), (1BDV), (1BIR), 1BIS, 1BJN, 1BLE, 1BMR, (1BQ), 1BQA, 1BQL, 1BRQ, (1BVB), 1BWZ, (1BYG), 1CAK, 1CEO, 1CHJ, 1CK, (1CM), (1CO), 1COK, (1DY), (1DZ), (1FU), (1GM), 1HK, (1IA), 1MA, (1OE), (1OJ), (1RV), (1SN), 1UA, 1XB, 1YB, 1YD, 1ZE, (2PV), (2XQ), (2AWF), Canadians, (3BP), (3EI), (3FQ), (3GE), (3JL), (3LI), (3QJ), (3AC), 3ACE, 3AFB, (3AHF), (3AHK), 3AIC, 3AIS, 3AJD, 3ALI, (3ALN), 3AOZ, (3ARM), (3ARN), 3ATZ, 3AUN, 3AUW, 3BFU, 3BGT, 3BJ, (3CG), 3CK, (3CN), 3DM, 3FB, 3GX, (3HG), (3HJ), (3IW), 3KM, (3LP), (3LY), 3NB, 3NH, (3OU), 3QF, (3RW), 3TH, 3TJ, 3TT, 3UC, 3US, 3VW, 3XF, (3XM), 3YO, (3ZA), (3ZF), 3ZO, 4AL, 4AS, 4BQ, (4BX), (4CX), (4DH), (4DQ), (4EA), (4EY), 4FD, 4GN, (4XC), 5DA, 5EA, 5ER, 5FJ, (5FV), 5HK, 5JD, 5XF, 5XU, 5ZL, 7XD, 7ZU, (8AAE), 8AAG, 8AAV, 8ACF, (8ADE), 8AFB, 8AFD, (8AFG), 8AFS, (8AGB), 8AGF, 8AGK, 8AGT, 8AHE, 8AHF, 8AHH, 8AHS, 8AIB, (8AIG), 8AIZ, (8AJO), (8AJT), 8AJV, (8AJW), 8AKQ, (8ALT), (8AMB), 8AMK, (8AMZ), (8ANO), (8AOI), (8AOT), 8AOU, 8APB, (8AQV), 8AQZ, (8ARD), (8ARG), (8ARS), 8ATU, 8AUE, 8AUR, 8AVI, 8AVO, 8AVT, 8AWR, (8AXN), 8AYN, (8AYS), 8BAH, 8BAI, 8BBY, (8BCO), 8BDB, 8BDL, (8BDY), 8BEN, 8BEP, (8BFH), (8BFV), 8BHA, 8BHV, 8BPB, (8BRL), 8BSY, 8BUA, (8BUN), (8BVA), (8BXC), (8CAY), 8CF, 8CG, 8CI, (8CP), 8CX, 8DE, 8DY, 8DZ, (8EA), (8EB), 8EF, 8EV, (8EW), 8FI, (8FT), 8GW, 8HG, 8HY, 8HU, (8IN), 8JJ, (8JP), (8JQ), (8JU), 8KE, 8KK, (8LH), 8LQ, (8MJ), (8MZ), 8NO, 8OI, 8OJ, 8PM, 8PQ, (8PT), 8OC, 8RB, (8RQ), (8RU), (8SP), (8TJ), 8TK, 8TT, 8TY, 8UC, 8UD, (8UP), 8VL, 8VQ, 8UR, 8VW, 8WA, (8WE), (8WO), 8WZ, (8XE), 8XU, 8YAA, 8YM, 8YN, 8YU, (8ZAC), 8ZG, 8ZO, (8ZN), 8ZR, 8ZY, (9AAW), 9ACB, (9ACY), 9ACZ, 9AEK, 9AEY, 9AF, 9AFF, 9AFK, (9AGH), 9AGR, 9AIP, (9AIR), 9AIU, 9AKR, 9AMA, 9AMK, 9AOE, 9AOJ, 9APK, 9AQE, 9AQM, 9AQV, 9ARG, 9ARZ, 9AS, (9ASJ), 9ASK, 9ASU, (9AU), 9AWX, 9AWZ, 9AXU, 9AZA, (9AZE), 9BDE, (9CP), 9DBW, 9DEH, (9DLX), 9DMJ, 9DOI, 9DPH, 9DQY, (9DWP), 9DXM, 9DYU, 9DZI, 9ET, 9GO, 9GX, 9HM, 9HR, 9II, 9JN, (9ME), 9MC, (9OX), 9PD, (9PS), (9RC), (9TL), (9UH), (9UU), 9VG, 9VL, 9VZ, (9WT), 9WU, 9YH, 9ZJ, 9ZN, 9ZY.

C.W.—1AEV, (1AFV), 1AJP, (1ALY), 1ARY, (1AVI), 1AVR, 1AWB, (1AZW), (1BCG), (1BDI), 1BEA, (1BKQ), 1BMY, 1BSD, (1BWJ), 1CDR, (1ES), (1PE), (1PT), (1QP), 1UN, (1XM), 1ZE, (2XQ), (Canadian 3BP), 3AAN, 3ABI, 3AHK, (3BEC), (3BHL), 3CA, (3CG), (3DH), (3EM), 3GR, 3HG, (3HJ), (3IW), (3MO), (3RF), 3ZO, (4BY), (4CX), 4FF, 4GL, 4GX, 4ID, 5XK cw voice, 6WV, (8ADR), (8AGZ), 8AIO, 8ALB, 8AML, (8AMM), 8AQV, 8AWP, (8AXC), 8BCI, 8BEF, (8BFX), 8BK, 8BNJ, 8BNY, 8BO, 8BOX, (8BPL), (8BRL), (8BUM), 8BVR, (8BWK), 8DE, 8DR, (8HJ), (8IB), 8IQ, 8IV, 8JL, (8JQ), 8LJ, (8LX), (8PT), 8SE, 8UJ, 8UO, 8UU, 8VJ, 8VO, 8WY, 8XK, 8XM, 8ZAE, 8ZD, 9AAY, 9AMB, (XF1), (NZO).

Distance Records

WHEN signals from a radio station are heard at unusual distances it is proof that the station is an efficient radiator of energy. The location, apparatus, construction and operation of an efficient station is therefore, of great interest to all amateurs, and THE WIRELESS AGE wants this information.

You are therefore requested to send us a monthly list of distant amateur stations heard, which will be published regularly. Report only stations located 200 miles or more distant from your station. Arrange the calls by districts in numerical order.

State whether the stations heard use a spark or C. W. transmitter. THE WIRELESS AGE will follow the records closely and whenever possible will secure and print illustrated articles on the stations consistently heard over long distances, for your benefit and the benefit of amateurs.

If a station is an efficient radiator of energy, it should be given proper credit in the history of amateur progress, and at the same time you will be be given credit for efficiency in receiving in having heard it, as your name, address and call letters will be published with all lists submitted by you.—THE EDITOR.

2AQP, E. LAUFER, 699 E. 137 Street, New York (December)

C. W.—1AEH, 1AFV, 1AGI, 1AIP, 1AJI, 1AJP, 1AJS, 1AKB, 1ALG, 1ANQ, 1AOE, 1ARY, 1AVR, 1AWB, 1AYL, 1AZJ, 1AZW, 1BAK, 1BCF, 1BCG, 1BDI, 1BEA, 1BES, 1BIS, 1BJH, 1BKA, 1BMY, 1BQE, 1BUA, 1BWJ, 1CAE, 1CAK, 1CCP, 1CF, 1CG, 1CGO, 1CJH, 1DE, 1EBJ, 1FB, 1FF, 1IV, 1NN, 1PT, 1QG, 1QN, 1QR, 1RU, 1RV, 1RZ, 1TS, 1UN, 1VG, 1XE, 1XK, 1XM, 1YK, 1ZE, 3AAB, 3AAE, 3ADT, 3AFY, 3AGN, 3AHK, 3AJN, 3BC, 3BEC, 3BH, 3BIY, 3BUW, 3BZ, 3CA, 3CC, 3CG, 3DH, 3FS, 3HG, 3IQ, 3IW, 3LO, 3LR, 3MO, 3NH, 3OR, 3RF, 3SM, 3ZO, 3ZY, 4AWL, 4BT, 4BQ, 4BY, 4CD, 4CO, 4EK, 4EL, 4EN, 4FF, 4FS, 4GK, 4GL, 4GX, 4HO, 4HW, 4ID, 4II, 4IL, 4XC, 4XD, 4XF, 4XQ, 4XR, 4ZF, 5HA, 5IL, 5LO, 7IY, 8ACF, 8ADG, 8AEF, 8AGZ, 8AIL, 8AIV, 8AMB, 8AMM, 8AMQ, 8ANP, 8AOA, 8AOE, 8AOG, 8APT, 8AQF, 8AQH, 8AOG, 8AWP, 8AWX, 8AWY, 8AXC, 8AXU, 8AXN, 8BFX, 8BMA, 8BMW, 8BM, 8BNJ, 8BNO, 8BO, 8BOX, 8BPL, 8BRL, 8BUM, 8BXA, 8CI, 8CJ, 8CUD, 8DR, 8DX, 8GV, 8GX, 8II, 8IQ, 8IV, 8JL, 8JQ, 8KM, 8KP, 8LJ, 8LP, 8LU, 8LX, 8OV, 8OW, 8RQ, 8SP, 8TB, 8UJ, 8UK, 8UN, 8VG, 8VJ, 8VY, 8WJ, 8WY, 8XH, 8XK, 8XM, 8XU, 8XV, 8ZAE, 8ZG, 8ZU, 8ZV, 9ACT, 9AHV, 9AIK, 9AJH, 9AYX, 9BBH, 9DMJ, 9DV, 9DWJ, 9GY, 9II, 9LQ, 9UJ, 9XM, 9ZD, 9ZV, 9ZY, Canadian 3BP, 9AW, 9EF, XF1, NMW, NZO, WL2, WR2.

Spark.—1AA, 1ABB, 1ACO, 1AEV, 1AHF, 1AHL, 1AIT, 1APO, 1ARY, 1ASF, 1AW, 1AWB, 1AYQ, 1AZK, 1BDI, 1BDT, 1BEA, 1BGF, 1BIR, 1BIS, 1BJN, 1BJS, 1BJW, 1BMA, 1BQA, 1BSR, 1 BVB, 1BWX, 1BWY, 1CAA, 1CHJ, 1CJA, 1CK, 1CM, 1CWB, 1DY, 1GM, 1HK, 1HO, 1IA, 1MA, 1OE, 1OJ, 1RV, 1SQ, 1UL, 1YD, 3AFB, 3AFD, 3AFK, 3AGT, 3AHF 3AHK, 3AIA, 3AIC, 3AIH, 3AII, 3AJD, 3ALN, 3ANI, 3ARM, 3AQR, 3ARY, 3AUE, 3AUW, 3BG, 3BM, 3CG, 3CK 3CN, 3FP, 3GM, 3GX, 3GY, 3HJ, 3HX, 3IW, 3LI, 3NB, 3OU, 3PB, 3RW, 3TP, 3VG, 3VW, 3XF, 3XM, 3ZO, 3ZV, 4AAX, 4AU, 4AXK, 4BF, 4BG, 4BX, 4CK, 4CX, 4DH, 4EA, 4EW, 4FD, 4GD, 4GN, 4LX, 4XD, 4XQ, 4YA, 5DA, 5FV, 5HY, 5JD, 5KM, 5XA, 5XB, 6EN, 8ACF, 8AFA, 8AFB, 8AFD, 8AFG, 8AFI, 8AGB, 8AHH, 8AHS, 8AHU, 8AIH, 8AJ, 8AJD, 8AJT, 8AJW, 8ALD, 8ALO, 8ALT, 8AMZ, 8ANK, 8ANO, 8ANV, 8AOT, 8APB, 8ARB, 8ARD, 8ARG, 8AUE, 8AVT, 8AXN, 8AXO, 8AYN, 8BAX, 8BCO, 8BEP, 8BFH, 8BGJ, 8BHV, 8BKS, 8BPT, 8BRL, 8BUK, 8BVA, 8CAH, 8CAY, 8CM, 8DO, 8DP, 8DY, 8DZ, 8EF, 8EV, 8EW, 8HG, 8HY, 8IFA, 8JD, 8JO, 8IO, 8IT, 8KK, 8LH, 8MJ, 8MZ, 8NI, 8NO, 8OE, 8OB, 8RO, 8SP, 8TK, 8UC, 8UP, 8VF, 8VW, 8WE, 8WK, 8WO, 8XE, 8YAA, 8YN, 8ZAC, 8ZN, 9ACX, 9AEU, 9AGH, 9AGR, 9ASJ, 9AWJ, 9AWU, 9AWX, 9AXN, 9AYH, 9AZE, 9CIP, 9CP, 9DLX, 9DMJ, 9DMO, 9DV, 9DWP, 9DX, 9GP, 9GV, 9HM, 9MC, 9MD, 9OX, 9PD, 9TK, 9TL, 9UH, 9WU, 9YC, 9ZJ, 9ZN, Canadian 3BP, 3MA, BG4.

2BAK, JOSEPH B. SLAVIN, Old Post Road Garage, Tarrytown, N. Y.

C. W.—1NE, 1ZE, 1BDI, (2BAS-phone), 3BP-Can., 3BZ, 3ZY, 3AAE, 3ADT, 3AHK, 3ALN, 4EI, (5FV), 5UU, 5ZA, 8BK, 8IV, (8IQ), (8VY), 8XK, 8XV, 8ZN, (8ZV), 8ZZ, (8ABO), 8AGF, 8AGL, (8AGZ), 8AIO, 8ALB, 8ALY, 8AOF, (8AOV), 8AOZ, 8AWP, (8BFX), 8BRC, 8BRL, 8BXA, 9DV, 9II, 9RT, 9XM, 9AKR, 9ARK, 9BLO, 9XAB, MNW, F1.

8YAA and 8AXC, EDWARD MANLEY, 328 Fourth Street, Marietta, Ohio

Spark.—1AW, 1CK, 1GM, 1YD, 1AEV, 1AMD, 1ARY, 1AZK, 1BGF, 2BB, 2BW, 2CY, 2DK, 2DN, 2EL, (2OM), 2TJ, 2TS, 2WB, 2WP, 2WZ, 2XK, 2XO, 2ZC, 2AIM, 2AOI, 2BIS, (2BJO), 3AC, 3BG, 3CC, 3CG, 3CN, 3DH, 3FB, 3FJ, 3HB, 3HJ, 3IW, 3LP, (3NB), 3OU, 3PU, 3QJ, 3UC, 3XM, 3YV, 3ZA, 3ZC, 3ZN, 3ZO, 3ZV, 3ZY, 3AAM, 3AAN, (3AHK), 3AJD, 3ALN, 3AMB, 3AOV, 3AQR, 3ARM, (3AUW), 3BFU, 4AS, 4BS, (4CD), 4CG, 4CX, 4DH, 4DT, 4EA, 4EK, 4EY, 4FB, 4FD, 4GH, (4GN), 4HS, 4HW, 4LX, 4XA, 4YB, 5DA, 5EK, 5ER, 5FJ, 5FV, 5HK, 5JD, 5KC, 5XA, 5XB, 5XK, 5XU, 5YL, (5ZL), 5ZE, 5ZW, 5ZZ, 5ZAB, 5ZAD, 8CG, 8CH, 8DP, 8DY, 8EB, 8EF, 8EW, 8FI, (8FT), 8HY, 8JJ, 8KK, 8LH, 8MJ, 8MZ, 8NG, 8NO, 8OI, 8SP, 8TJ, 8TT, 8VL, 8VQ, 8WE, 8WK, 8WO, 8WZ, 8XA, 8XE, 8YN, 8ZA, 8ZN, 8ZY,(8ZAC), 8AAV, 8ACF, 8ACH, 8AFB, (8AFD), 8AHH, 8AHU, 8AIZ, 8AJT, (8AJV), 8AKS, 8ALU, 8AMZ, 8AOG, 8AOT, 8APB, 8ARD, (8AUE), 8AUY, (8AXN), 8AXO, 8AXQ, 8AXS, 8AYN, 8BAH, 8BCO, 8BDY, 8BEP, 8BFH, 8BIB, 8BRL, 8BUN, 8BVA, 8CAY, 9AU, 9CP, 9DF, 9DR, 9FU, 9GS, 9HI, 9HM, 9HR, 9JQ, 9KF, 9LF, 9LW, 9MC, 9ME, 9NR, 9OX, 9PD, 9PS, 9TL, 9UH, 9UU, 9VL, 9WU, 9WT, 9XI, 9YA, 9YB, 9YC, 9YM, 9YQ, 9YAC, 9YAE, 9YAK, 9ZC, 9ZJ, 9AAP, 9AAW, 9ACB, 9ACN, 9AEG, 9AEY, 9AFF, 9AGG, 9AGH, 9AGR, 9AIF, 9AIG, (9AIR), 9ALU, 9AMK, 9AMO, 9AMQ, (9AMS), 9AOJ, 9AOU, 9AOX, 9AQE, 9AQM, 9ARR, 9ASJ, 9AWX, 9AXU, 9AYH, (9AYW), 9AZA, 9AZE, (9BDS), 9BEE, 9DAJ, (9DHZ), 9DLX, 9DMJ, (9DOI), 9DQQ, 9DQY, 9DRT, 9DRV, 9DVE, (9DWP), 9DXE, 9DXM, 9DZI, Canadians 3BP, 3GE.

C. W.—(1QP), 1RU icw, 1TS, 1UN, 1XM icw, 1ABU, 1AJP, 1ANQ, 1ARY, 1AVR, 1BCF, 1BCG, 1BDI, 1BKQ, 1BUI, 2BB fone, 2CS, (2EH), 2FD, (2FP icw)cw, 2KP, 2MW, 2NN, (2OM), 2RU, 2XD fone, 2XQ cw icw, 2ZD, 2ZL fone cw, 2ZV, 2AAB, 2AAX, 2AFP, 2AGB, 2AJE, 2AST, 2AUU, 2AWA, 2AWF, 2AWL, 2BAK, 2BAY, 2BBF, 2BEA, 2BEB, 2BFZ, 2BML, 2BRB, 3BB fone, 3BC, 3BZ, 3CA, 3FS, 3HG icw, 3HJ, (3MO), 3RF, 3XT, 3ZO fone cw, 3ZY, 3ZAB, 3AAE, 3AHK, 3AIS, 3AJB, 3BIY, 4BQ, 4BY, 4CE, 4CO, 4EH, 4EL, 4EN, 4GL, 4HO, 4HW, 4II, 5AA, 5UU, 5ZL, 8AR, 8BK, 8BO, 8BU, 8CI icw, 8DR, 8II, 8IV, 8JQ, 8KH, 8LX, 8SP cw icw, 8UJ, 8VJ, 8XK, 8XM, 8XV, 8ZG, 8ZU, 8ZV, 8ABO, 8AGZ, 8AIL, 8AIX, 8ALB, 8ALV, 8AMK, 8AMM, 8AMQ, 8AOA, 8AQI, 8AQV, 8AQZ, 8ARW, 8AUO, 8AWP, 8AWX, (8BEF), 8BFX, 8BLT, 8BNY, 8BOX, (8BUM), 8BXA, 8BXF, 9FM, 9II, 9NX, 9PG, 9VG, 9WC, 9ZY, 9ZAF, 9AJA, 9AJH, 9AKR, 9BBF, 9BED, 9BIK, 9BMD, 9DVA, 9DWJ, 9DYU, 9DZQ, Canadians 3BP, 9AW, KDKA, NMW, NOF cw icw, NSF cw icw, NZO cw icw, WDY, WJZ, XF-1, KY.

8BDB, JOE J. HILL, 1572 Virginia Street, Charleston, W. Va. (December)

Spark.—1AW, 1BVB, 1MA, 2AR, 2AFK, 2AIM, 2AHU, 2BAS, 2DK, 2DR, 2OM, 2TC, 2WB, 3AC, 3AHK, 3AJD, 3AOV, 3AQR, 3ARM, 3AUW, 3BG, 3CG, 3CN, 3DM, 3HJ, 3OU, 3RW, 3UC, 3VW, 3YV, 4BQ, 4CX, 4DH, 4EA, 4FD, 4GN, 4YB, 5BY, 5EK, 5FV, 5HK, 5PY, 5XA, 5ZAB, 5ZL, 5ZZ, 8ACF, 8AFB, 8AFG, 8AHS, 8AIZ, 8AJT, 8AJV, 8AKQ, 8ALT, 8AMB, 8AND, 8ANO, 8ANV, 8AOT, 8APB, 8ARD, 8ARS, 8AUE, 8AVT, 8AXN, 8BQ, 8BCO, 8BDY, 8BEP, 8BEN, 8BFH, 8BHV, 8BIB, 8BQT, 8BSY, 8BUN, 8CAY, 8DP, 8DY, 8DZ, 8EB, 8EF, 8EV, 8HR, 8IA, 8KP, 8LF, 8LH, 8MJ, 8ML, 8MZ, 8OI, 8OJ, 8TK, 8TT, 8UC, 8UP, 8UW, 8VL, 8WE, 8WL, 8WO, 8XE, 8YAA, 9AAK, 9ACL, 9ACN, 9AEK, 9AEY, 9FC, 9AGH, 9AGR, 9AIF, 9AIR, 9ALP, 9AMK, 9AMS, 9APS, 9AQE, 9AQM, 9ARG, 9ASJ, 9AUH, 9AWU, 9AWX, 9ABL. Canadian 3BP, 3LI.

C. W.—1AFV, 1AJP, 1ARY, 1BCG, 1CAE, 1CLI, 1QN, 1UN, 1XM, 1YK, 1ZE, 2AAB, 2AAX, 2AJW, 2AWF, 2AWL, 2BAK, 2BB, 2BGH, 2BFG, 2BSC, 2FD, 2FP, 2KL, 2NN, 2NZ, 2OE, 2UD, 2VA, 2XQ, 2XR, 2ZV, 3AAE, 3AAY, 3AIS, 3BA, 3BEC, 3BHL, 3FS, 3LR, 3MO, 3VS, 3XL, 3ZY, 3ZO, 4BK, 4CY, 4DH, 4EL, 4GL, 4TD, 4ZF, 8ABQ, 8ADR, 8AGZ, 8ALB, 8ALY, 8ARW, 8AWP, 8AWY, 8BO, 8BU, 8BEX, 8BFX, 8BNJ, 8BNY, 8BOX, 8BUM, 8BXA, 8BZJ, 8DR, 8DV, 8FQ, 8HJ, 8IK, 8JQ, 8NN, 8OW, 8UJ, 8XK, 8XM, 8XAE, 9AAY, 9AJH, 9AKR, 9ARK, 9BAP, 9BIZ, 9II, 9XI.

8GP.A. HARP, 4838 Lincoln Avenue, Detroit, Mich. (December)

Spark.—4EA, 5FO, 5HK, 5XA, 5ZZ, 8CP, 8LF, 8SP, 8UC, 8UR, 9AAP, 9AAW, 9ACN, 9AGH, 9AKU, 9AQE, 9AWX, 9DKV, 9DQQ, 9DWP, 9DXM, 9DYU, 9HM, 9LF, 9LW, 9TL, 9WT, 9ZN.

C. W.—1ARY, 1BCG, 2AWL, 2FP, 3AAB, 3AAE, 3AAX, 3AHK, 3HG, 3LR, 4EN, 4BY, 4GL, 5LA, 8AGZ, 8AQV, 8BEF, 8BFX, 8BMA, 8JL, 8LX, 8XV, 9AUL, 9AJA, 9AYS, 9BBF, 9HW, 9LE, 9NX, 9RV, 9XI.

8ZAC, CLIFFORD H. GALLOWAY, Barnesville, Ohio (December)

Spark. — 1ABB, (1AEV), 1AKG, (1ALK), 1AMD, (1APO), 1ARY, 1AW, 1AWN, 1AZK, 1BDC, 1BGF, (1BVB), 1BWK, 1CHJ, 1CM, 1DY, (1DZ), 1GM, 1HK, 1RV, 1SN, 1TS, 1WR, 1YD, 2AAF, (2AER), 2AFP, (2AIM), 2AJE, 2ALY, 2AQI, 2AWF, 2AWU, 2AYR, (2BJO), (2BK), 2BM, 2CC, 2CM, (2CY), 2DA, 2DN, (2EL), 2DR, 2FD, 2FJ, (2FP), 2GK, 2JU, 2MK, 2MO, (2OM), 2PI, 2PL, 2PV, (2QR), 2RM, 2TF, 2TJ, 2TL, 2TS, 2VK, 2VM, 2VU, 2WB, 2WC, 2YV, 2XK, 2ZZ, (3AC), 3ACM, 3AHF, (3AHK), 3AJM, (3ALN), 3ANQ, 3AOU, (3AQR), (3ARM), (3AUW), 3BG, 3BGT, (3BFU), 3BHL, (3CG), 3CN, 3DM, 3FB, 3GG, 3GM, (3HG), (3HJ), 3HZ, (3IW), 3KM, (3LP), 3NB, 3OB, 3OU, 3PB, 3QV, 3RW, (3TA), 3UC, 3UK, (3UQ), 3XC, (3XF), 3XM, 3YV, 3ZA, 3ZJ, 3ZO, (4AG), (4AS), 4AU, 4BI, 4BQ, 4BX, 4CG, (4CX), (4DH), 4EA, 4EL, 4FD, 4GH, 4GN, 4GU, 4HS, 4WC, 4YA, (4XC),

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C. W.—(1AFV icw), 1AJP, 1ARY, 1AYL icw, 1BCG, 1BDG, 1BEA, 1BEP fone, 1BKE fone, 1ID, 1QN, 1QR fone, 1TS, 1UN, 1XD fone, 1XM icw, 2AAX, 2AJR, 2AJW, (2ARB), 2ARY, 2AWL, 2BB fone, (2BML), 2BRB, 2BRC, 2BFZ, (2CAP icw), (2EH), 2EL, 2FD, (2FP icw), 2FS, 2KL, 2OM, (2RB), 2RU, 2TK, 2UD, 2WX, 2XB fone, 2XD fone, 2XI fone, 2XJ fone, (2XQ icw), 2XR fone, 2ZD fone, 2ZL, 2ZV fone, 3AAE, 3AEV, 3AFU, 3BA, 3BQ, 3BZ, 3DH icw, 3GR, 3HJ, 3SQ, 3ZO fone, 4BQ, 4BY, 4EB, 4EL fone, 4GL, 4GX, 4XC, 5FV icw, 5UU icw, 5ZA, 6XAD, 9AAV, 9ANE, 9ARK, 9EK, 9FM, 9NX, 9RT, 9ZV, 9XM fone. Canadian 3BP fone. Also C.W. AN5, NSF, WA1, WL2, XF1.

8BYZ, HARRY SCHOENFELDER, 513 Boone Street, Pottsville, Pa. (December)

1AG, 1AW, 1HO, 1TS, 1VO, 1XE, 1XD, 1ZE 1AFV, 1AEV, 1ARY, 1BEG, 1BEO, 1BYG, 1XAB, 2EH, 2EL, 2ER, 2CK, 2XB, 2XQ, 2BKA, 2BWK, 3AF, 3AG, 3AH, 3BD, 3BF, 3BK, 3BM, 3BX, 3CK, 3DH, 3DF, 3DM, 3FB, 3FR, 3GG, 3GX, 3HJ, 3IW, 3PL, 3LP, 3RB, 3RG, 3TA, 3TS, 3UZ, 3XF, 3ZO, 3ZV, 3ZY, 3AAV, 3ABK, 3AJD, 3AJS, 3ACV, 3AIC, 3ARY, 3ASQ, 4EA, 8AP, 8OP, 8OX, 8BF, 8BU, 8CG, 8EF, 8HR, 8HY, 8IN, 8ME, 8OA, 8OF, 8OP, 8OX, 8PQ, 8SP, 8ZY, 8AEF, 8AFD, 8AIK, 8AIO, 8ALM, 8APB, 8ASY, 8AVV, 8AYN, 8AZO, 8BEP, 8BPO, 9CP, 9VL, 9XM, 9ZF, 9TL, 9AIR, 9DWP.

8ZG, A. J. MANNING, Salem, O. (December)

C. W.—1QN, (1TS), (1ZE), 1AFV, 1ARY, 1BCG, 1BDI, 1BWJ, 1XAD voice, 2BB, 2BG, 2CS, 2OM, 2OZ, 2UD, 2WP, 2ZV, 2ZD, 2XQ, 2AAB, 2AAC, 2AAX, 2AUU, 2AWL, 2BIS, (2BAK), 2BED, 2BEB, 2BUA, 3BZ, 3CA, 3EQ, 3FM, 3FP, 3FR, 3FS, 3LR, 3MO, 3VA, 3XY, 3ZM, (3AAE), 3AAN, 3AFB, 3AFU, 3BEC, Can. 3BP, 4BT, 4BQ, 4BY, 4CD, (4EL), 4ID, 4XC, 4YA, 4ZF, 6XAC, 6XAD, 8AI, 8VY, 8XY, 8ZU, 8ZZ, 8BRC, 8BXA, 8BZJ, 9EA, 9EM, 9II, 9PG, 9RT, 9VG, 9ZB, (9ZT), 9ZY, 9XM, 9XI, 9AAS, 9AAV, (9AJH), 9ACO, 9AKB, (9AKR), 9AJP, 9AVN, 9BBF, (9BIC), 9BLO, 9BED, 9DWI, 9XAB.

WUBC, FIELD ARTILLERY SCHOOL, Camp Knox, Ky. (Dec. and Jan.)

Spark—2MO, 2FD, 3HD, 3ZZ, 3GO, 4AG, 4BQ, 4GN, 5ZAB, 5ZZ, 5ZA, 5XA, 5XB, 5ZL, 5JN, 5ZJ, eights and nines too numerous.

C.W.—1AN, 1XE, 1UN, (1ARY), 1AMQ, 1BCG, 1BUA, 1ZE, 1BKG, 1XM, 1BZY, 1AYL, 1CAK, 1WX, 1AJZ, 1ARN, 1BCX, 2WP, 2XQ, 2FP, 2FD, 2JM, 2BQ, 2BK, 2AKO, 2BRZ, 2BIS, 2BSY, 2BGH, 2BFZ, 2BZG, 2AWL, 2AAB, 2AAE, 2AHK, 2FS, 2MO, 2AHA, 2FF, 2ZL, 2KL, 2BGU, 3BZ, 3DH, 3EG, 3EN, 3EZ, 3FM, (3FS), 3HJ, 3XC, 3ZO, 3ZY, 3HG, 3TJ, (3BP-Can.), 4AS, 4BK, 4BY, 4BZ, (4BQ), 4CO, 4CX, 4DH, 4HW, 4XB, 4GL, 4GN, 4GE, 4GU, 4EL, (4FT), 4AI, 4ID, 4II, 4LE, 4EN, 5DA, 5KU, (5KP), 5UU, 5FV, 5JD, 5DU, 5ZAK, 5KA, 5ZC, 5ZZ, (5ZU), 5FV, 5XJ, 5FX, 5XB, 5ZA, 5LO, 5ZL, 6WV, 7ZU, 8AF, 8BA, 8CP, (8BK), 8BO, 8DR, 8DV, 8EA, 8FI, 8GE, 8GV, 8IH, 8II, 8IV, 8JL, 8JP, 8JS, (8KH), 8NM, (8BK), (8BUM), 8ARZ, 8ZV, 8ZZ, 8ZAE, 8GX, 8ANO, 8BFZ, 8AWP, 8AMZ, 8AWY, 8AOV, (8BXA), 8AGZ, 8BPL, 8NO, 8ILV, 8ARX, 8AKJ, 8BRC, 8AQF, 8QAE, 8ZG, 8ZAC, 8UJ, 8AWF, 8VY, 8ADV, 8MQU, 8AYP, 8AIO, 8ARZ, 8YAF, (8UK), 8BEQ, 8AJU, (8LX), (8LV), (8LU), 8BFX, 8AFD, 8AGL, 8AHR, 8ACR, 8AHR, 8BEP, 8AKJ, 8ZN, 8XV, 8WY, 8ABW, 8AOG, 8AGZ, 8PF, 8AY, 8WP, 8ML, 8ALY, 8BEF, 8BEP, 8BS, 8BBW, 8UJ, (8VJ), 8WR, 8ZP, 8NQ, (8BOX), 8ADR, 8BRZ, 9AU, 9BL, (9ARK), (9HK), 9DY, 9FM, 9HI, 9HM, 9HW, 9II, 9IO, 9JD, 9LF, 9KF, (9LQ), 9NQ, 9NR, (9NX), 9AON, 9PS, (9PG), (9OU), 9UC, 9ZB, 9ZY, 9ZQ, 9WD, (9YC), (9LK), (9ZJ), (9VG), (9BDE), (9BIK), 9BOP, 9BBF, 9YQ, 9AUA, (9PG), 9AQR, 9AJA, 9HW, (9AYS), 9FG, 9DKP, 9AKR, 9ALG, 9ARY, 9AKB, 9KR, (9AAV), 9ARJ, 9BBF, 9BHE, 9ARJ, 9XI, 9IX, 9DVA, 9DKV, 9II, WL2, WJZ, WDY, KDKA, NX1, (AN5), (XF1), XB1, NZO, NMW, NSF.

8CP, ORLO PALMER, 233 E. 11th Street, Holland, Michigan. (December)

(Can. 2EL), Can. 3BK, Can 3BP, Can. 3GE, Can. 3IE, (2AWF), 2FP, (2OM), 2PU, 3AIC, 4BQ, 4DH, 4GN, 5FV, 5HD, 5HK, 5XA, 8CI, (8DZ), (8EB), (8EW), (8FI), (8FT), 8MJ, 8MO, (8NO), 8OU, 8PM, 8RU, 8TJ, (8TK), (8UP), (8VY), (8WE), (8WD), 8XE, 8TO, 8ZA, (8ZF), (8AFB), (8AIB), 8AIO, (8AIX), 8AKQ, (8AMZ), 8APB, 8AQV, 8ARS, (8ASZ), 8ATU, (8AUM), (8AVT), (8AWU), 8AXN, 8AYS, (8AZG), 8BAP, 8BCO, (8BCY), (8BEN), (8BEP), (8BLW), (8BOG), (8BPG), (8BTL), (8BUC), 9CA,

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Professional Radio Equipment at Amateur Prices
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WIRELESS EQUIPMENT CO. Inc.
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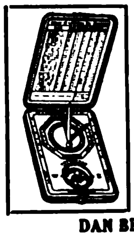

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A Vest Pocket Sun-dial and Compass in one

THE ONLY COMPASS THAT GIVES THE TRUE DIRECTION

DAN BEARD says: "I would like to see every scout have one"

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Largest Stock Radiotrons and Kenotrons in U. S. A.

Write for our new price list No. 100-E

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9CP, 9DZ, 9ET, (9FU), 9GN, 9HT, 9HM, (9JN), 9KO, 9MC, (9OA), (9OX), 9PS, (9PD), 9RC, 9RY, 9TL, (9UG), (9UH), (9UI), 9UU, (9VL), 9WU, (9XI), 9ZN, 9ACB, 9AFC, 9AGR, 9AIF, 9AIK, 9AIR, (9ALH), 9AMA, 9AMQ, (9ANO), 9ANP, 9AON, 9APA, 9ARG, (9ARZ), (9ASE), (9ASJ), (9ASK), 9ATN, 9AWX, 9AXU, (9AZE), (9AZF), 9BDS, 9BIJ, 9DBU, (9DKQ), 9DQQ, 9DNJ, 9DNC, 9DYU, 9DYY, 9DZE, (9DZI), 9DWP.

8ZAE (ex-8ZD), Pittsburgh, Pennsylvania, (December and January).

C.W.—(1AFV),(1AJP),1ANQ,(1ARY), 1BCG, 1BDC, 1BKQ, 1BMY, 1BDI, (1BWJ), 1AZW, 1BSD, 1BEA, 1CAK, 1DY, 1FF, 1UN, 1RQ, (1RS), 1TS, (1RZ), 2AAB 2AID, (2AWF), 2AJW, 2AYQ, 2BIS, (2BFZ), 2BC, 2BRB, 2BEB, 2BB, 2CBG, 2AYI, 2AVX, 2DN, 2EL, 2FP 2NZ, 2OM, (2MW), 2PF, 2KP, 2WP, 2XB, 2XQ, 3AFB, 3ARM, 3AFU, 3AHK, 3ANJ, 3AEV, 3BZ, 3BFU, 3CC, (3CG), 3GE, 3HG, 3HJ, (3MO), (3SM), 3ZY, 3ZO, 3ZZ, 4BQ, 4BY, 4BK, (4EL), 4EN, 4CY, 4DC, (4EH), 4FF, 4HO, 4GL, 4GH, 4HW, 4II, 4ID, 4ZE, 4ZF, 5FV, 5LA, (5UU), 5ZA, 8ADR, 8AIL, 8AIZ, (8AQV), 8AMQ, (8ARW), (8AWY), 8AWF, 8AKI, 8AGI, 8AGL, 8BFH, (8BFX), (8BRC), (8BXA), (8BNY), 8BVT, 8BLT, 8AWP, 8BEF, 8BZO, 8BOX, 8BBK, 8BRT, 8IQ, (8IV), 8II, 8IH, 8JS, 8JL, 8KH, 8LV, 8NI, 8SP, 8UJ, (8UK), 8VK, 8VL, 8SE, 8UQ, (8YAC), (8ZG), 9AAS, 9AJA, 9AAV, (9AJH), 9AKB, (9AKR), 9AXK, 9AYS, 9AJP, 9BNO, 9BBF, 9DV, 9DWJ, 9GL, 9HW, 9II, 9XM, 9ZB, NSF, NZO, NOF, NMW, (DF-1), CF-2, CL-2, KDPM, WJZ, WDY, KYW.

Spark—1AW, 1AYL, 1BRW, 1HO, 1BOQ, 1SC, 2AAC, 2AAX, 2AJW, 2AR, 2EL, 2OM, 2FP, 2QR, 2NZ, 3ALN, 3BP, 3GO, 3HJ, 3KG, 3LI, 3EI, 3GN, 3QW, 3PU, 3OU, 3XC, 3XL, 3XM, 3YK, 4BQ, 4BX, 4CX, 4EA, 4GN, 4II, 5DA, 5FJ, 5FV, 5HK, 5PY, 5XA, 5XF, 5ZL, 5ZZ, 8AFG, 8AYN, 8AXK, 8BEP, 8BXK, 8CEB, 8CH, 8AXO, 8AJB, 8DY, 8FI, 8BXC, 8GH, 8HG, 8JO, 8JJ, 8KK, 8MM, 8NB, 8NZ, 8MJ, (8PT), 8TT, 8TJ, 8OL, 8WA, 8WE, 8WO, (8XE), 8YN, 8YM, 8ZA, 8ZAC, 8ZP, 8ZAA, 9ACB, 9ACY, 9AU, 9AAX, 9AWX, 9AMB, 9AQE, 9ARG, 9AGR, 9ARY, 9DLX, 9DXM, 9DYM, 9DSO, 9FS, 9HR, 9CA, 9MC, 9ME, 9OX, 9UU, 9UH, 9VL, 9YM, 9YC, 9YA, 9YB, 9YAE.

Longest distance covered by 8ZAE to date 6BF on January 1st with 10 watts CW.

National Amateur Wireless Association

(Continued from page 42)

LOCAL amateur wireless operators have become so numerous that the St. Catharines Radio Association, Ontario, has decided to rule the waves overhead. Hereafter low power transmission only will be permitted during certain night hours, while others are set apart for long distance work exclusively and for testing.

"Free ether for all" is the rule during the daytime.

The following schedule for operation of amateur stations has been adopted:

From 7 a. m. to 5.30 p. m. free ether for all.

From 5.50 p. m. to 6 p. m. testing only.

From 6 p. m. to 7.30 p. m., low power transmission only.

From 7.30 p. m. to 10 p. m. silence, listening-in period for concerts and so forth.

From 10 p. m. to 11 p. m., free ether for all.

From 11 p. m. to 7 a. m., long distance work only; all local work ceases.

△ △

THE Arlington Radio Club, Arlington, Mass., has recently acquired a station license, 1COD, and is now operating a telephone transmitter using 5-watt tubes. This station is noted for its fine modulation. Plans are under way to install in the near future a C.W. transmitter using 3 50-watt tubes for C.W., ICW and phone.

△ △

WIRELESS enthusiasts of all ages and both sexes compose the membership of the Seattle Radio Association.

The purpose of the organization is twofold. It serves to control the traffic of the air to both radiophone and telegraph communication, supervision being placed in the hands of Traffic Manager Howard S. Mason, who is also president of the club. Rules governing the hours at which local and long distance conversations may take place have been worked out by the club, and as a result, the confusion which reigned prior to its inception is being replaced by carefully regulated traffic.

The other object of the club is to encourage experiments.

Regular weekly meetings of the club at the assembly hall of the Chamber of Commerce will be addressed by authorities on radio developments.

△ △

B. P. WILLIAMS, station call 8ZAE (formerly 8ZD) of Pittsburgh, Pa. using two 5-watt UV-202 tubes has been reported heard in Santa Paula, Cal., by Paul

Hello Everybody!

(This is Radio KZC Speaking)

THE LATEST SELECTION IS

"MAIL ORDER BLUES"

Have you ever heard it? No! Well, then you must be one of the many satisfied customers who have tried

Wesrad Service

Send For Our

LATEST PRICE DICTIONARY

It is indispensable to the careful purchaser

The Fifth Edition has 3,000 Circulation

Are you one of the wide-awake men who use this Bulletin and service exclusively.

WESTERN RADIO ELECTRIC CO.

550 South Flower
Los Angeles, Cal.

274 Twelfth Street
Oakland, Cal.

K. Churchill, 6BF. Mr. Churchill writing under date of January 2, states he heard 8ZAE on night of January 1, calling CQ, and then 5FA at about 9.50 P. M., Pacific time. The C.W. signals were QRZ on one stage. Mr. Williams has checked this DX record with his log and found it correct.

△ △

IN listing the stations heard by P. F. Godley in Scotland, during the recent trans-Atlantic tests, the station of J. Edward Brown, 1BKA, Glenbrook, Conn., was omitted through error. Signals from 1BKA station were heard by Mr. Godley on the same night that signals from 1RZ, 2ARY, 2AJW and 3FB stations were heard.

△ △

IN addition to 2ZL, the following stations have been reported as having been heard by English amateurs, during the recent trans-Atlantic tests.

1ZE, Irving Vermilya, Marion, Mass.

1DA, Frank Wigglesworth, 2 West Hill Place, Boston, Mass.

1UN, Joseph B. Dodge, 26 School Street, Manchester, Mass.

1AFV, F. Clifford Estey, 11 Mt. Vernon Street, Salem, Mass.

△ △

SIGNALS from the station of A. C. Mertz, 9AKR, Mt. Carroll, Ill., have been heard recently at 6AOW, Riverside, Calif., and also at other points on the Coast. The transmitter at 9AKR is a 100-watt Kenotron set, employing two kenotrons and two UV-203 Radiotrons.

△ △

AT its regular monthly meeting, January 27, a paper was presented on Radio Central, world's largest and most powerful radio station, by Pierre Boucheron. Slides of the various views of the big plant and its apparatus were shown and described and the subject was concluded by the showing of moving pictures featuring construction scenes as well as most interesting sidelights and personalities during the recent formal opening. The event took place at Columbia University School of Journalism, New York City. This pictorial exhibit may be borrowed by responsible local radio clubs. Inquiries should be directed to the secretary of the Radio Club of America, 380 Riverside Drive, New York.

Batteries Reverse Polarity At Low Temperature

(*Continued from page* 31)

does in ordinary operation at normal air temperatures. But between 80 and 100 degrees below, after the electrolyte had "under-cooled," it increased in temperature slightly as freezing began. The voltage dropped down to nothing at about minus-100 degrees Centigrade and then, at a slightly lower temperature, strangely registered a minus reading. Still more unexpected was the fact that there was registered as high as 10 volts in the direction opposite to the normal voltage. Then the voltage violently fluctuated ranging from positive ten volts to negative ten volts. These reversals happened whenever the frozen electrolyte of the cell "ticked."

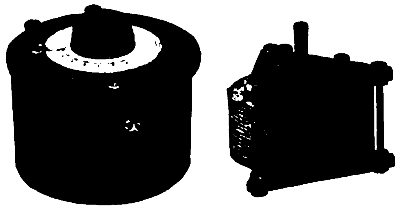
A dry cell of an electric flashlight of commercial grade was given the same cooling treatment, and after giving slightly higher voltages than normal at 115 degrees below, it gradually reduced voltage until at 170 degrees below it reversed its voltage also.

But while the voltages shown under the sub-arctic temperatures are reversed and remarkably large, no hope is held out that storage batteries can be recharged by the simple method of cooling them to the low temperatures used in the Bureau of Standards' tests. The currents at these low temperatures are very small.

Coupler for Short Waves

(*Continued from page* 39)

er right hand corner is the primary switch, which may be any standard lever and seven contact points. On the right hand side are drilled six 1/16 inch holes for the binding posts. The binding posts, knob and dial, switch lever, contacts, etc., are put on the panel and the panel screwed to the base. The primary, secondary and tickler are connected to the six posts and the taps fastened to the contacts. Only one variable condenser across the secondary is necessary. The coupler gives best results when used in the hook-up shown in figure 2.



TYPE 247 CONDENSER

ANOTHER
GENERAL RADIO
ACCOMPLISHMENT

FOR MANY YEARS the GENERAL RADIO COMPANY has been supplying the research and educational institution laboratories throughout the country with high-grade radio apparatus suitable for research work. Only instruments of the finest quality are accepted in this class of work. The experience obtained in this line has enabled us to design instruments for the citizen radio field that represent the latest developments in engineering and mechanical skill.

The newest instrument in this line is the variable air condenser illustrated above. Here is an instrument of laboratory quality, yet selling at a price within reach of the experimenter.

EXAMINE SOME OF ITS FEATURES:

CAPACITY SCALE: In addition to regular scale divided into 100 equal divisions, the dial is also graduated in micromicrofarads, thus showing capacity at any setting.

LOW DIELECTRIC LOSS: Hard rubber is the only solid dielectric used. Quantity used is small and is so placed with respect to the electrostatic field that the dielectric hysteresis losses are kept a minimum. This is a very important feature in obtaining sharpness of tuning, and one which is commonly overlooked in condenser construction.

PLATES SOLDERED TOGETHER: Resistance is reduced and kept constant. Capacity, also, kept constant.

HEAVY ZINC PLATES, ADEQUATELY SPACED: Danger of short circuiting minimized.

SPECIAL SPRING BEARINGS: Tension always remains the same. Good contact insured.

THRUST ALL ON ONE BEARING: No short circuiting if distance between bearings is changed.

LOW ZERO CAPACITY: Makes wide range possible.

METAL CASE GROUNDED TO ROTARY PLATES: Shields condenser, reducing capacity effects of hand while tuning.

You cannot afford to deny your set the advantages of this condenser. Give the long distance messages a chance.

Inspect this condenser at your local dealer's.

TYPE 247 CONDENSER, COMPLETELY MOUNTED,
CAPACITY .001 MICROFARAD

PRICE $5.50

MAY ALSO BE SUPPLIED UNMOUNTED FOR PANEL MOUNTING
Send for Free Radio Bulletin 910-W

GENERAL RADIO CO.
Massachusetts Avenue and Windsor Street
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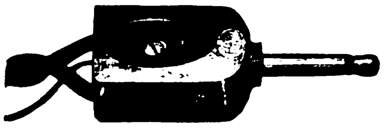
Standardize on General Radio Equipment Throughout



FIRST!
BEST!
100%

PACENT UNIVERSAL PLUG

This is a radio plug. It fits all standard jacks—and pocketbooks. Of course, no solder is used to make a connection with the Pacent plug. The cord tips are held in such a way that pulling—up to and beyond the breaking of the cord—only tightens the grip. Yet the tips may be released instantly by proper manipulation of the springy strips. A soft, velvety black finish with polished metal parts makes the Pacent plug easy to look at; it is truly beautiful. Rugged construction makes the device good for a lifetime. There is only one Pacent Plug and that is approved by the United States Government and used by the foremost amateurs. Don't forget to insist on the original, 100% plug.

FROM YOUR DEALER OR DIRECT - $2.00

You should have a copy of our booklet PW entitled "*Pacent Radio Essentials*" which will be sent you on receipt of five cents in stamps.

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A perfect rectifier at last, fully automatic and fool-proof in every respect. It can be operated by anyone.

The **HOMCHARGER**

connects to any alternating current socket, gives a taper charge—will fully charge any "A" battery over night. It is self-polarizing. Connect your battery either way and it will always charge.

Automatically disconnects battery when power is interrupted. Restarts charging when connections are restored. Adjustable for wave form, frequency and voltage. Contains only one moving and two wearing parts, lasting thousands of hours, replaceable as a unit for $1.00.

The highest charging rate, greatest efficiency, and simplest of any rectifier selling for less than $100.00. Bulletin 628 proves it. Ask for your copy.

Manufactured in sizes for charging three or six-cell batteries from both alternating and direct current circuits. Cannot injure battery—will last a lifetime—approved by underwriters—satisfaction guaranteed. For sale by all Radio, electrical and accessory dealers or shipped express prepaid for purchase

PRICE $18.50

ATTENTION MOTORISTS!

Send for special Bulletin 58, showing how easy it is to "HOMCHARGE" your battery.

THE **AUTOMATIC ELECTRICAL DEVICES CO.**
119 West Third Street, Cincinnati, Ohio
Canadian Distributors—Rowley & Moody, Ltd., Toronto.

Hook-up That Simplifies Tuning

(*Continued from page 40*)

would be to place a telephone transmitter between the middle tap and the ground, eliminating the transformer in series with the grid leak, but ground modulating appears to be not so efficient as the grid leak variety.

The aerial need not be pretentious to obtain surprising results, merely a single strand inside of house to garret will suffice. Later, when your enthusiasm grows, an outdoor multi-strand aerial for real long distance work connection with amplifier circuits, may be erected.

Using a dry battery instead of the usual storage battery for filament lighting, a pair of 3000 Murdocks and a set of standard type B battery, twenty-five dollars ought to cover the expense of a crackerjack outfit, using this simple circuit.

Queries Answered

ANSWERS will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of one reader can be answered in the same issue. To receive attention these rules must be rigidly observed.

Positively no questions answered by mail.

C. H. C., Chicago, Ill.

Q. 1. Have never seen a plan for a step-up transformer printed, and would like you to supply me some working data.

Ans. 1. A step-up transformer for vacuum tubes is described in our Prize Article in this issue. Additional information on transformers will be found in "The Wireless Experimenter's manual" by Elmer E. Bucher, price $2.25.

* * *

G. C. H., Fort Stockton, Texas.

Q. 1. Kindly give an explanation of how it comes that I have no difficulty whatever in copying WGG on galena, just an ordinary galena hook-up, any hour of day or night when he is sending. I get other C. W. stations also, at times, but he is always readable, and comes in nearly as strong as on one V. T.

Ans. 1. This is probably due to the presence of some form of high frequency induction which acts as a beat to produce the signals which you receive. Just what is the cause of it however, we are unable to state not being familiar with the exact situation of your antenna with respect to power lines.

MUTUAL PURCHASERS ASS'N
Send stamp for particulars regarding the saving you can make on anything radio you require.
2-4 Stone Street, NEW YORK

SECOND ANNUAL AMATEUR RADIO

Convention-Exhibition

A Real Radio Convention and a Real Exhibition of Radio Equipment

Pennsylvania Hotel - New York

MARCH 7-8-9-10-11, 1922.

Another year has rolled around and the time for the Second District Convention and Radio Show, the big event of radio, is almost here. Everybody remembers, (for everybody was there), the smashing big success of last year. Well this year is going to add another big success to the history of radio. There isn't any doubt about it, for everybody who was there last year will be on hand again to meet everybody else, and will bring with them all the new converts to the cause created by radiophone broadcasting.

This Simon-pure radio show will be the most interesting and instructive affair of the kind ever held. The general arrangements are practically the same as last year.

The glass-enclosed roof garden of the hotel will be the exhibit hall, and the adjoining Butterfly Room affords an excellent lecture hall, with adequate seating capacity. Only papers of vital interest to amateurs will be presented.

Developments in the new and rapidly broadening field of radio have come thick and fast since last year. Some of them are so amazing in character and so far beyond anything yet generally known to the average radio operator, that any attempt to describe them on this printed page would result only in a very poor and inadequate effort. Come yourself and hear about them and see these new epoch-making devices in actual operation, and you will immediately wonder at the almost unlimited applications of radio to useful purposes.

A banquet for everybody, male and female, will be held on the night of the 11th (Saturday). And it's going to be SOME banquet. This refers both to the dinner and what will be done and who will do it. All the big men of radio will be there.

That dusky-hued girl who was the sensation of last year's dinner will be there again, to demonstrate the last gasp in Hawaiian grass costumes. All male guests will be searched at the door for concealed lawn-mowers.

The Convention and Exhibition will open at 7 p. m., March 7, and will be open from 2 p. m. to 11 p. m. on the following days. A season badge will be sold at the door for 50 cents, covering the five days. One time admissions 25 cents.

The banquet charge will be $4.00. The number which can be accommodated is limited to 600. Tickets will be allotted up to this number only, in the order in which applications are received. Applications by mail should be made to John Di Blasi, 6 Warren Street, New York.

Tickets are also on sale at

Continental Radio & Electric Corporation,
6 Warren Street, New York.

Manhattan Electrical Supply Company,
17 Park Place, New York.

J. H. Bunnell Company,
32 Park Place, New York.

American Electro Technical Appliance Company,
235 Fulton Street, New York.

Wireless Press,
326 Broadway, New York.

This convention-exhibition is held under the auspices of the Second District Executive Radio Council. It is non-partisan, non-sectarian, non-everything—just a straight out and out Second District Amateur Radio Affair, sponsored by all the radio clubs of the Second District.

This is an unparalleled opportunity for material gain, for acquiring knowledge, the making of personal acquaintances, and for general good. It will be the biggest thing ever done in the history of amateur radio.

EXECUTIVE RADIO COUNCIL--Second District

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J. J. Kulick

Radiophone Broadcasting

(*Continued from page 27*)

W J Z Notes

THE Radio Chapel Service seems to be very popular with radio fans and their immediate friends. Innumerable letters have come to our attention in which the owner of the receiving set has had as many as twenty friends listening to this extremely novel method of observing the Sabbath. One commendable instance of appreciation for this home delivered service was a contribution sent by E. D. Every of Roselle Park, N. J., who, after hearing the sermon delivered, forwarded to the preacher a collection taken up by him at the conclusion of the services on Sunday night, feeling, as he stated, that this was the only lacking element in the otherwise complete service.

To unfortunate people who through some affliction are unable to go about the radiophone means immeasurable pleasure. One man, acknowledging the Sunday service sent out by WJZ, states that he suffers from paralysis and is unable to leave his bed, but by the aid of the phone by his side enjoyed to the fullest extent the first sermon he has heard in years.

At the 23d Regiment Armory, Bedford and Atlantic avenues, Brooklyn, where the Brooklyn Manufacturers' Industrial Exposition was held, large audiences were entertained with the WDY and WJZ radio programs. A new amplifier was tried out in one of the squad rooms and afforded entertainment for every one within ear-shot of the place.

Paul F. Godley at WDY

PAUL F. GODLEY greeted his fellow amateurs by informing them that he was particularly pleased to be able to speak to his many friends from the very room where he spent many happy moments a few years ago while employed at the then Marconi Plant, now being used by WDY.

A list of stations heard was then given, it being pointed out that, while 27 stations in all were heard, only 7 were spark stations while 20 of the stations used continuous wave, the latest and most efficient method of transmission. Some of these stations using such small power inputs as 30 watts. A plea was made by Mr. Godley for the abandonment of spark methods by amateur relay men, and in particular the abandonment of the spark coil which is, as generally used, obnoxious to all interests and a great cause of present day interference.

It is an interesting fact that Mr. J. O. Smith, Chairman of the 2nd District Executive Radio Council, who introduced Mr. Godley to his Radio Audience, was also heard in England, through his station 2ZL during the trans-Atlantic tests, but by British Amateurs. Mr. Smith, who is an amateur of many years experience, first met Mr. Godley as the direct result of secret service work done with Mr. Smith as the subject under investigation and the happy results of which developed considerable humor.

The Radio Installation at WDY is located in an artistically appointed studio which occupies a room at the old factory of the Marconi Wireless Telegraph Co. at Roselle Park, once filled with a maze of precision machine tools used for the construction of model radio equipment.

During the World War, Godley spent much of his time both day and night in this room in an effort to hasten the supply of equipment for use by the Army and Navy. A list of stations heard by Mr. Godley at Ardrossan, Scotland, follows:

SPARK

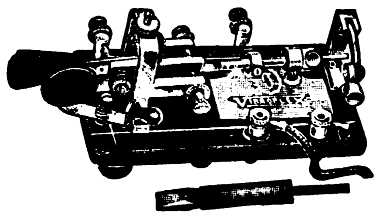
1ARY Burlington, Vt.
1BDT Atlantic, Mass.
2BK Yonkers, N. Y.
2EL Freeport, L. I.
1AAW Illegal station not located.
2DN Yonkers, N. Y.
3BP Newmarket, Ontario.

CONTINUOUS WAVE

1RU Hartford, Conn.
1ARY Burlington, Vt.
1BDT Atlantic, Mass.
1BKA Glenbrook, Conn.
1YK Worcester, Mass.
2FD New York, N. Y.
2ARY Brooklyn, N. Y.
2BML Riverhead, N. Y.
8BU Cleveland, Ohio.
8XV Pittsburgh, Pa.
1RZ Ridgefield, Conn.
1BCG Greenwich, Conn.
1BGF Hartford, Conn.
1XM Cambridge, Mass.
2EH Riverhead, N. Y.
2FP Brooklyn, N. Y.
2AJW Babylon, L. I.
3DH Princeton University.
3FB Atlantic City, N. J.
8ACF Washington, Pa.

About a half dozen stations were also heard by British Amateurs during these tests, one of which was that of Mr. Smith as mentioned above. Complete reports from British stations have not yet been compiled, but will probably be published at an early date.

Mr. Godley concluded his talk by calling for close co-operation on the part of the great amateur body with the government radio officials so as to prevent unnecessary interference and illegal transmissions.



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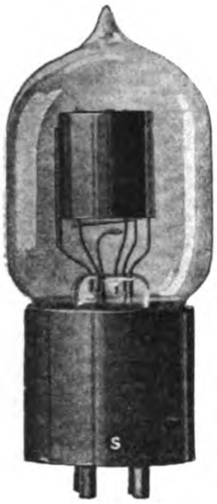

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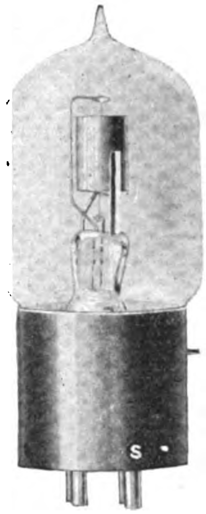

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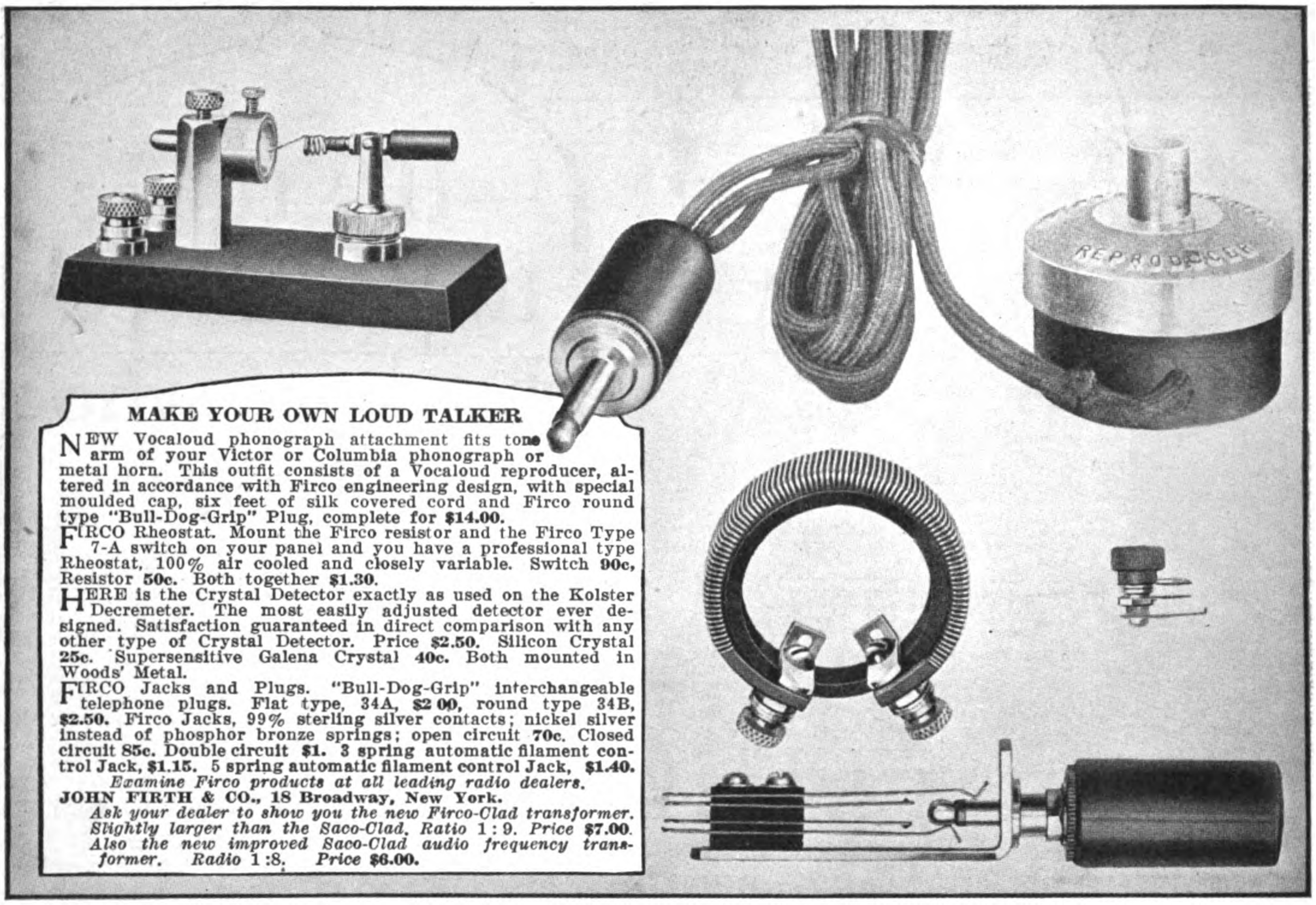

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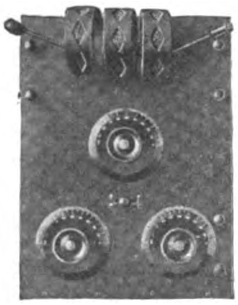

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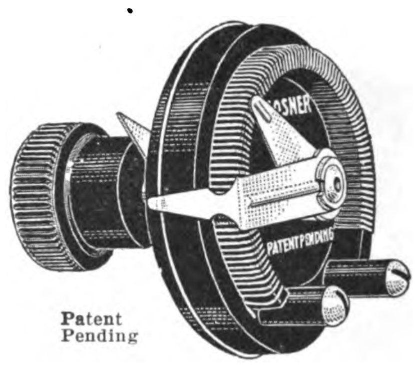

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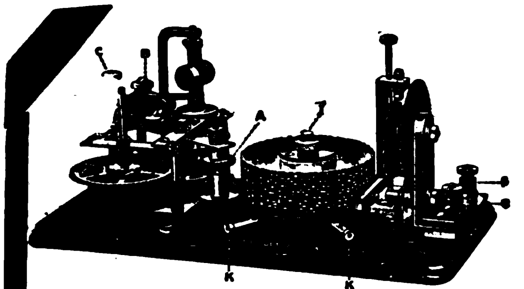

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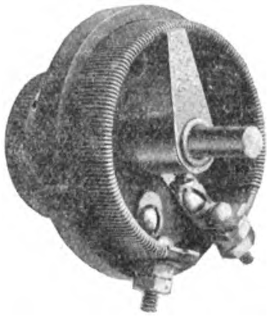

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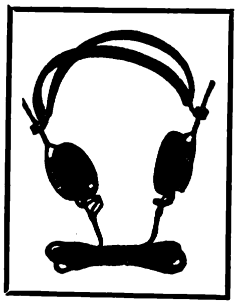

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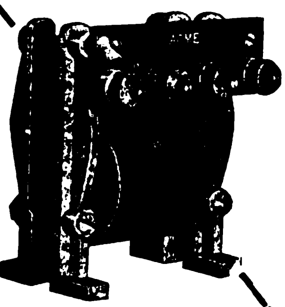

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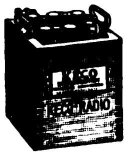

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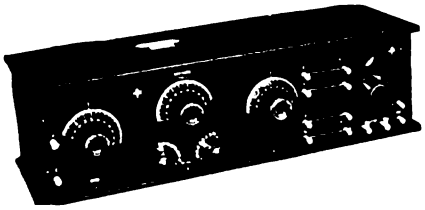

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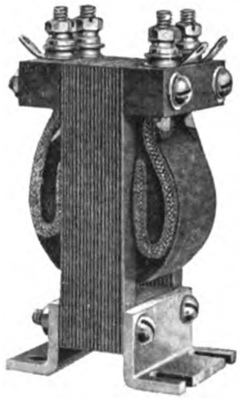

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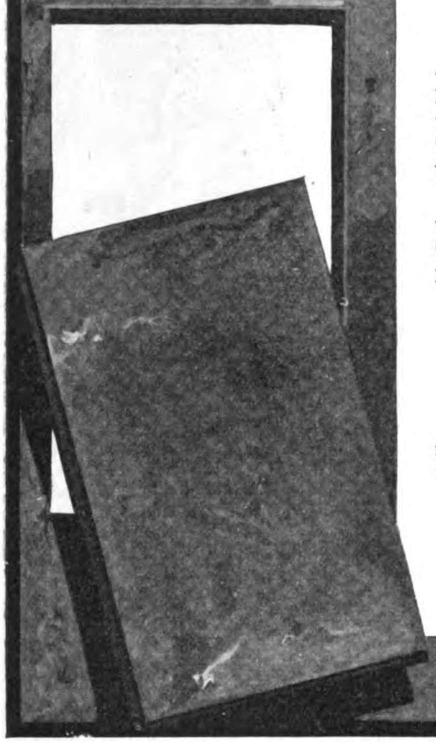

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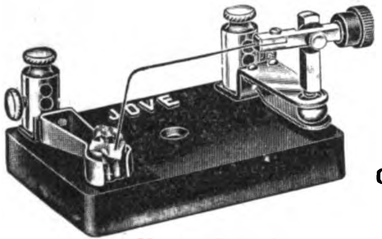

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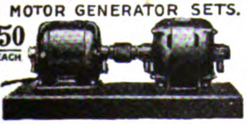

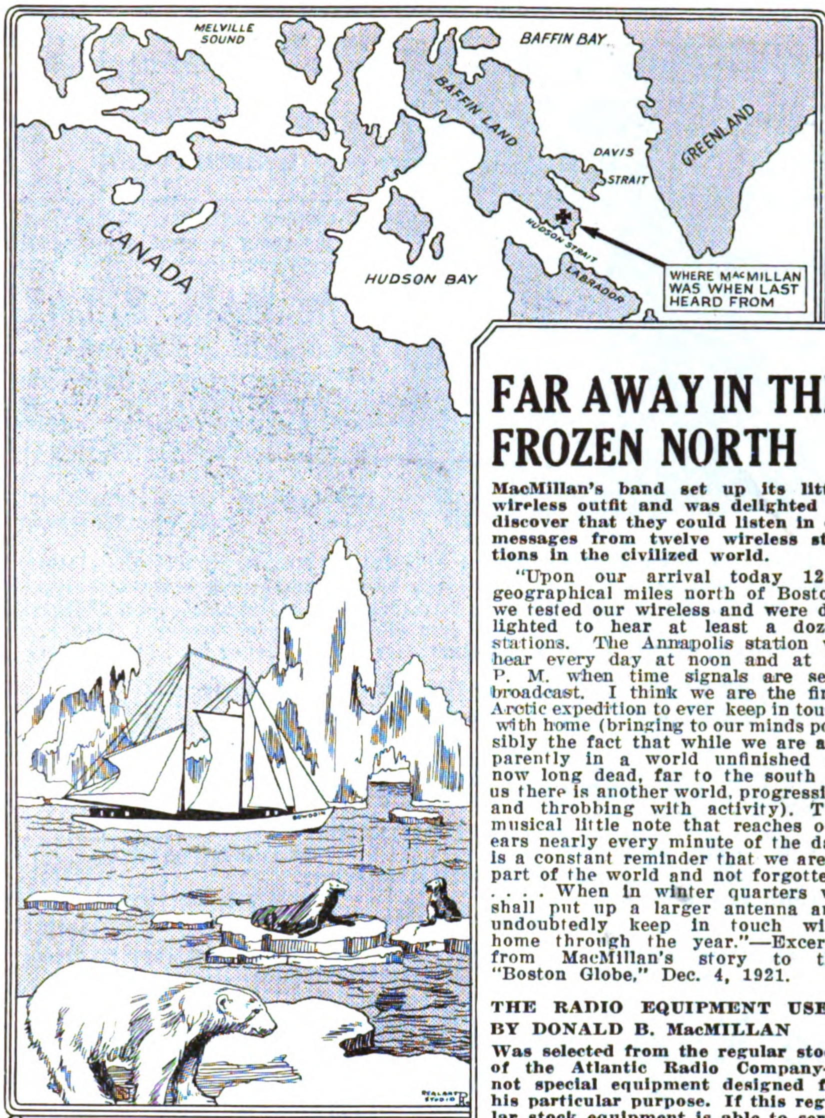

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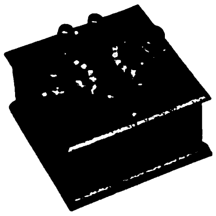

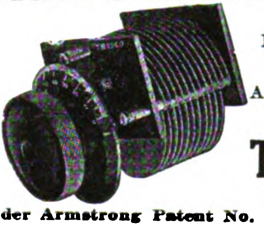

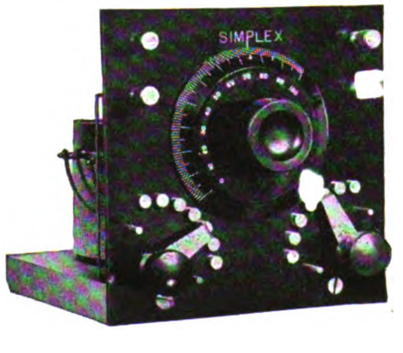

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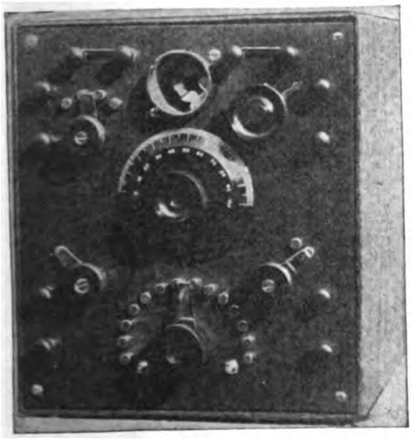

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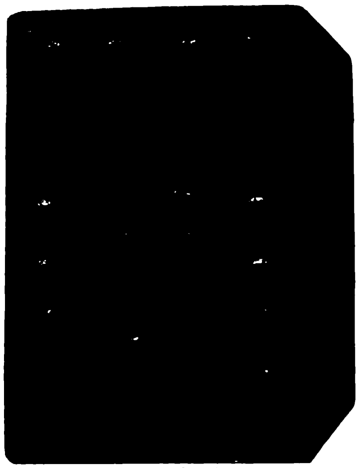

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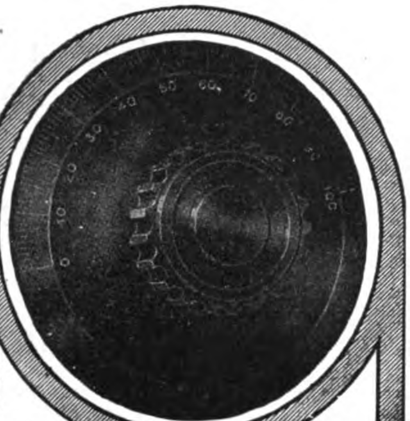

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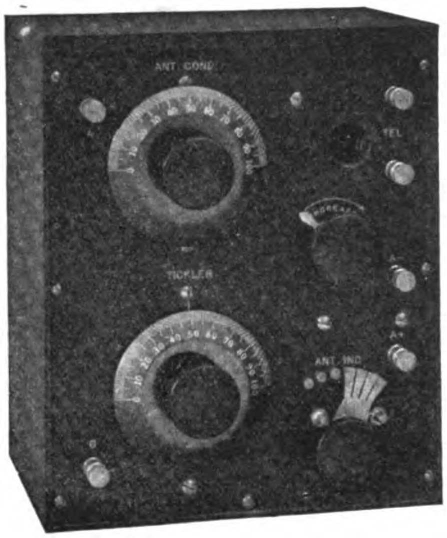

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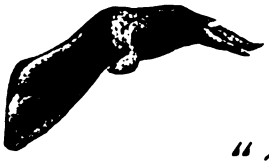

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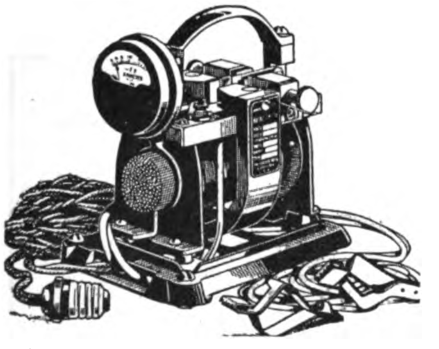

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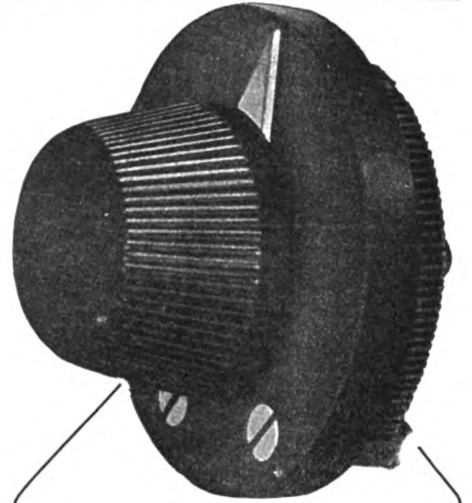

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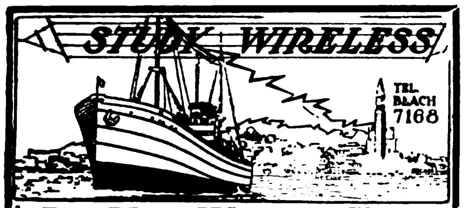

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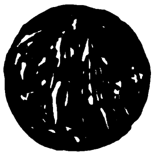

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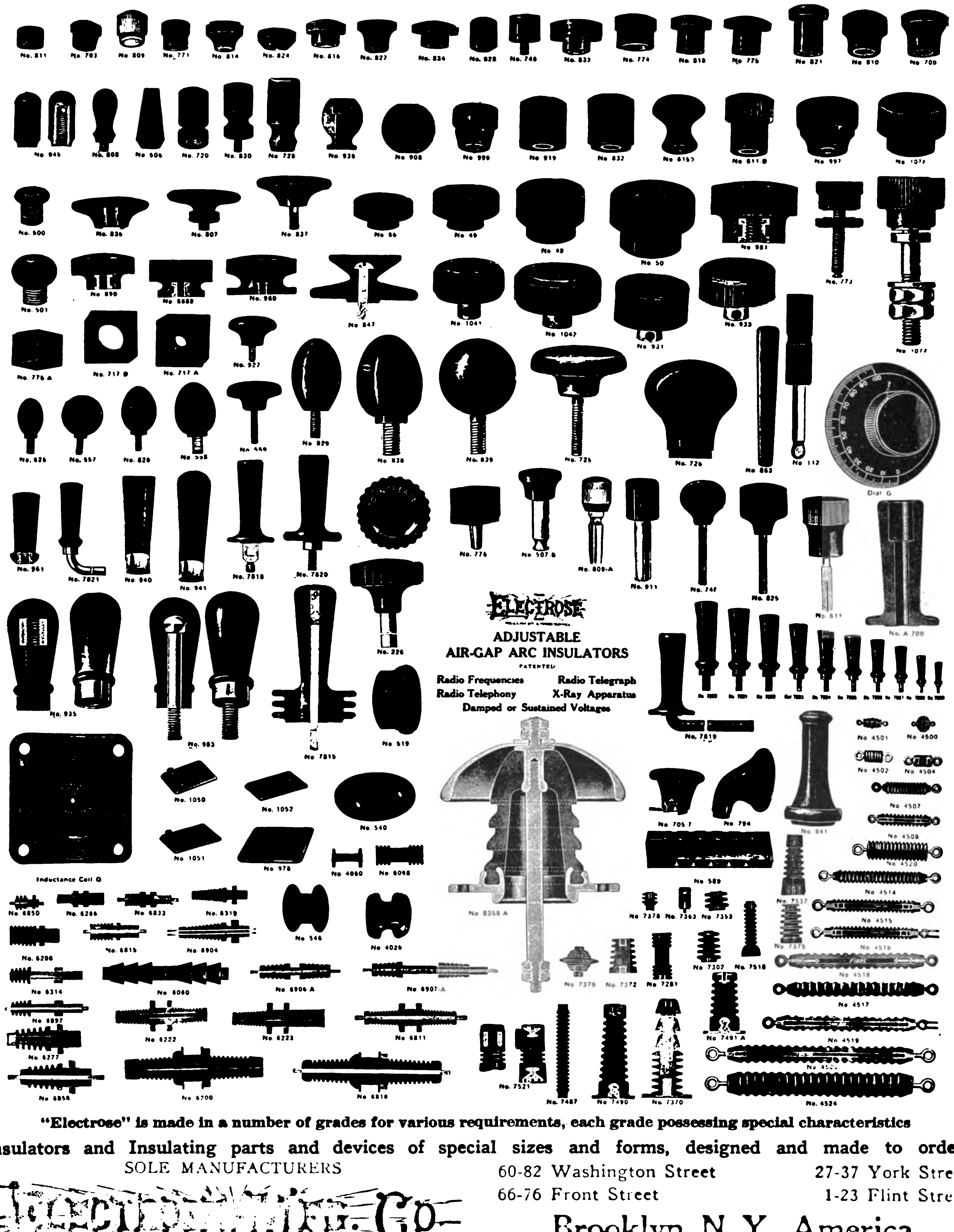

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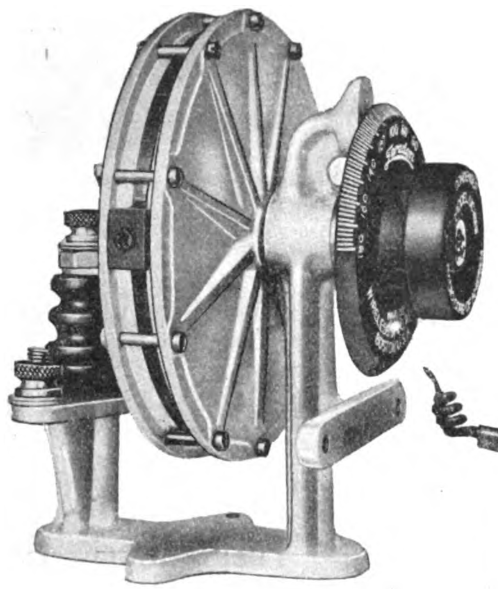

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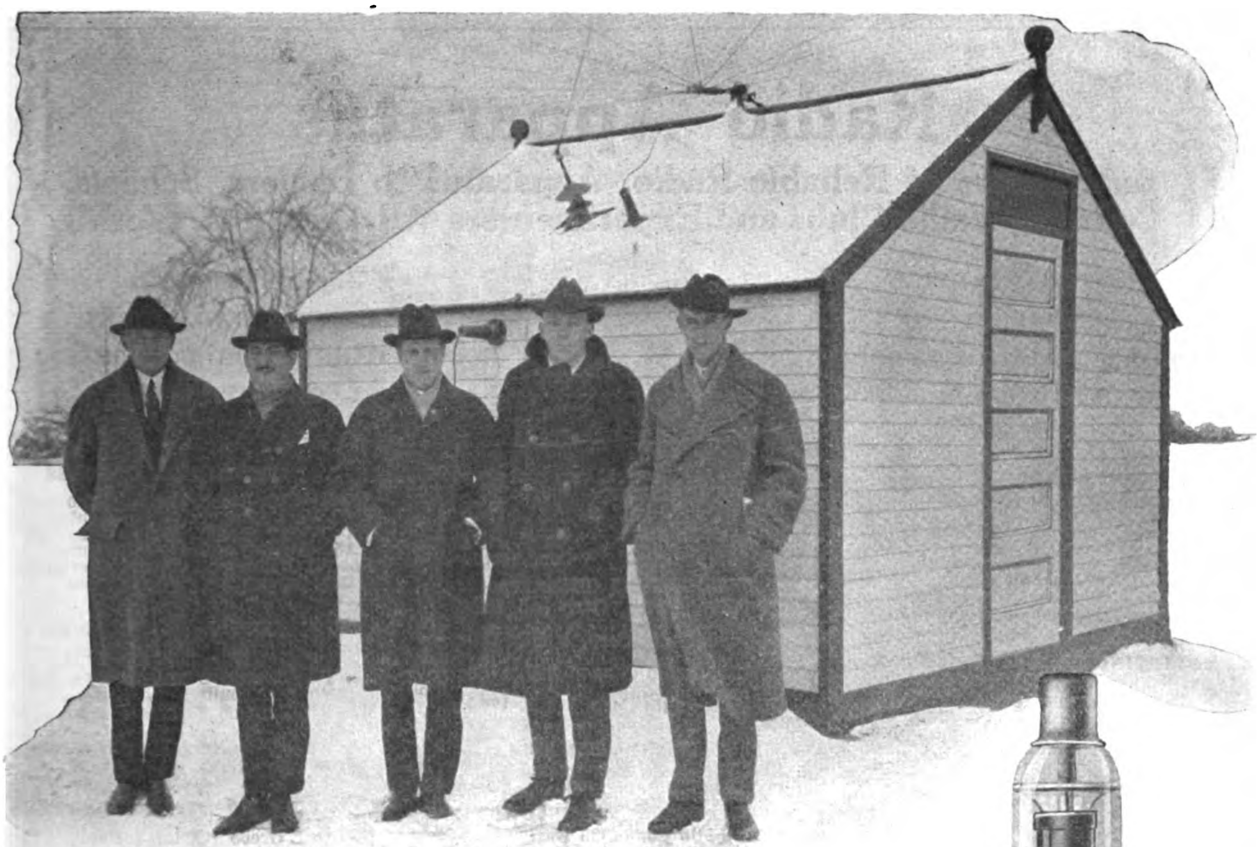
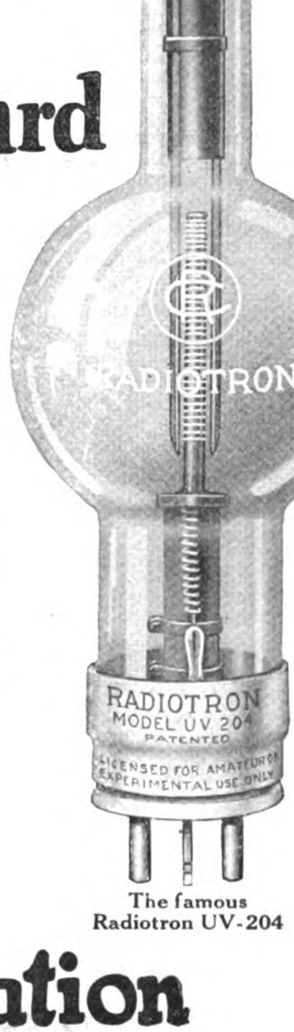


Their station was heard in Scotland



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There is no substitute for the MAGNAVOX, the reproducer with the movable coil. It is the *original* loudspeaker, now the *world's standard* loudspeaker. With the Radio MAGNAVOX it is easy to reproduce radio music for indoor or outdoor entertainments, for concerts, and even for dances.

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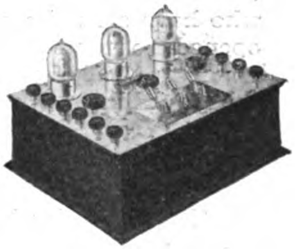
MAGNAVOX

MAGNAVOX NEW POWER AMPLIFIER



The New MAGNAVOX Power Amplifier is designed for use with transmitter tubes and high plate voltages to furnish amplifying power for the Radio MAGNAVOX where great sound intensity and large volume are required. It also minimizes the possibility of distortion. Solid mahogany case, sits either flat or on edge. Simply throw the switches to operate. Two-stage and three-stage types. Ask your dealer for prices and particulars. Write the Magnavox office nearest you for *free* folder.

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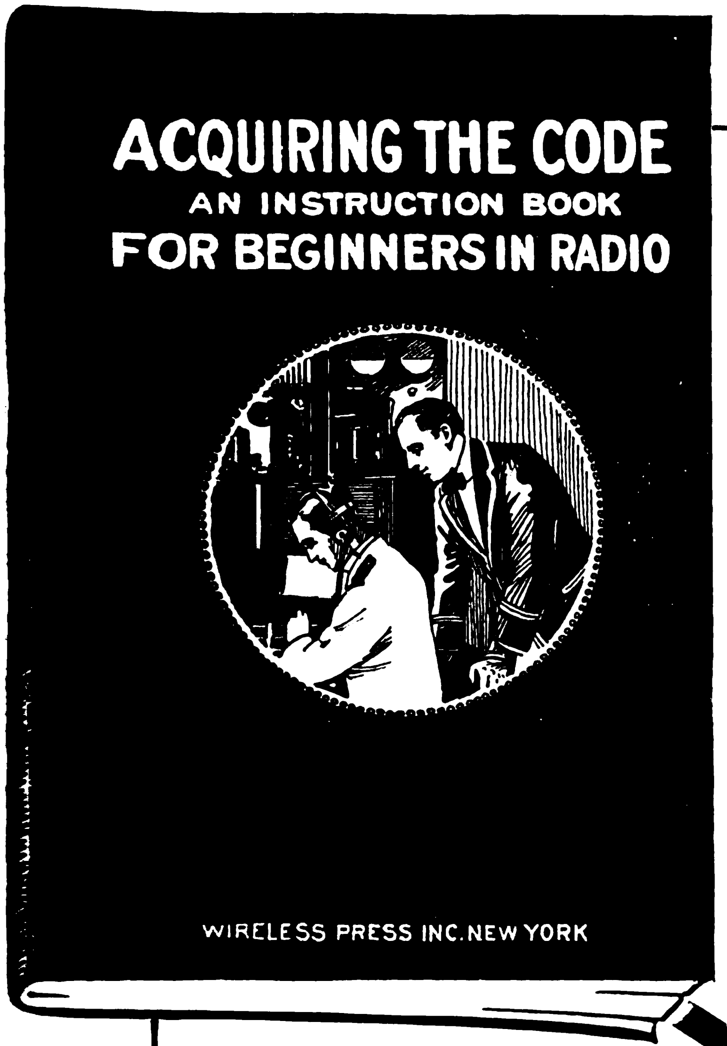

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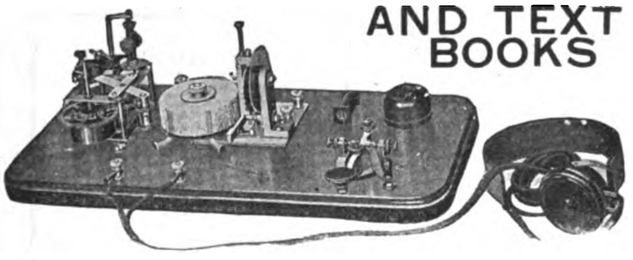

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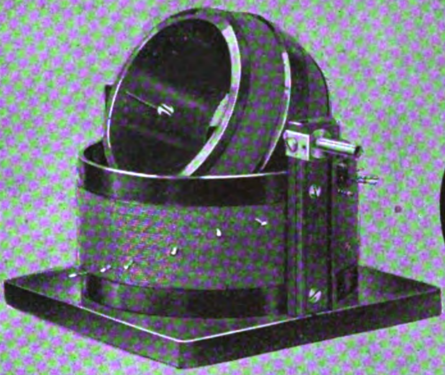

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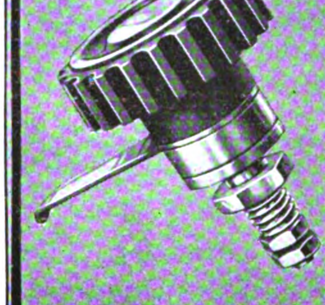

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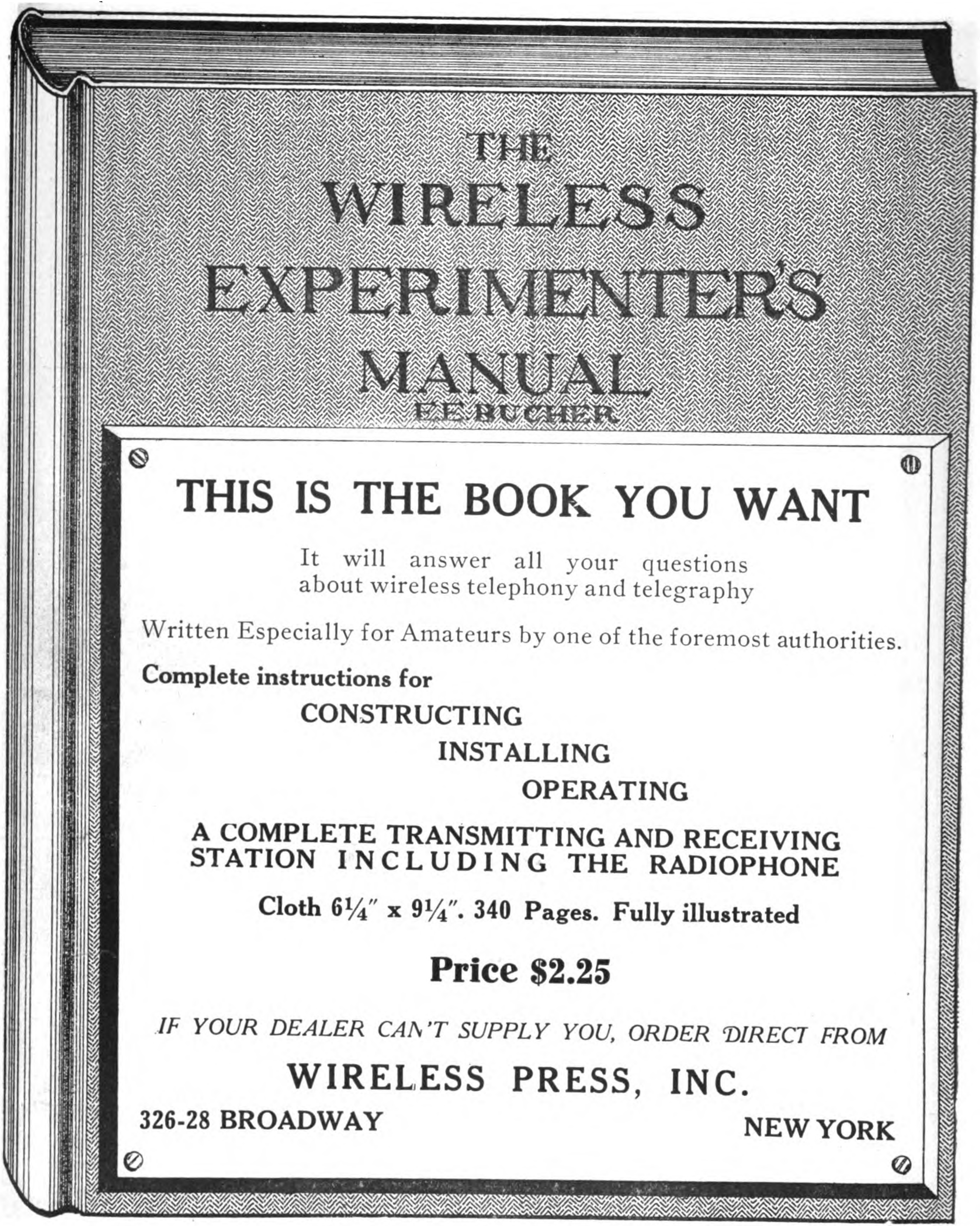

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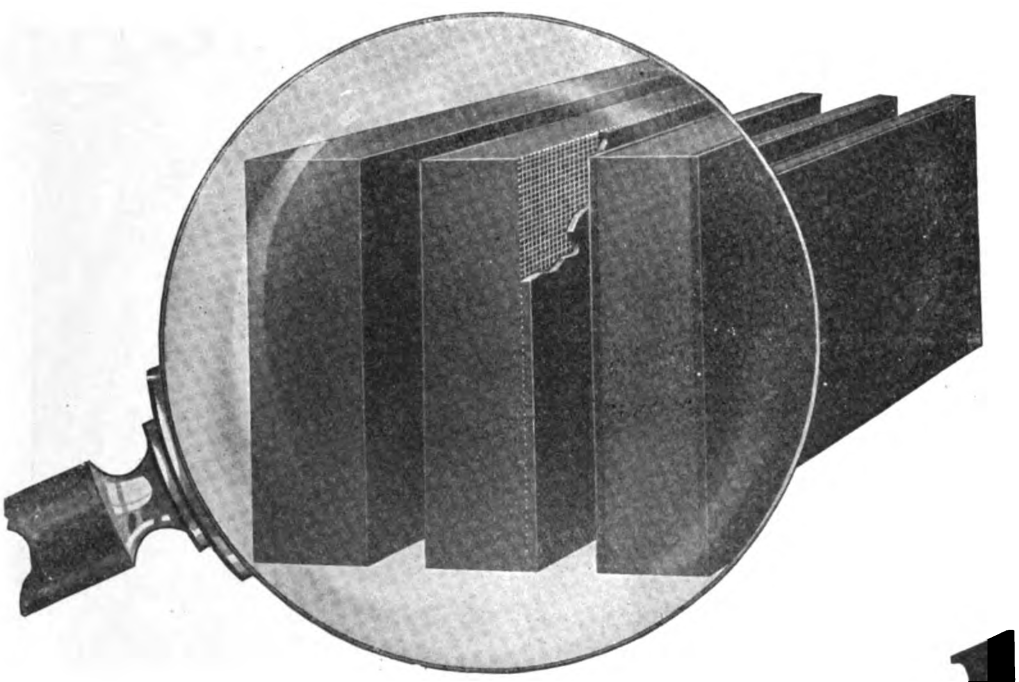

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(patent applied for) is made of a hard fibre center section veneered on both sides with Condensite Celoron Grade 10. It meets the demand for quality plus low cost. We recommend it for use in receiving sets and other apparatus where very high voltages at radio frequencies are not involved. It has the same fine surface as Grade 10 and similar machining and engraving qualities.

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The Stromberg-Carlson

No. 2-A Radio Head Set

These Stromberg-Carlson Radio Head Sets reproduce broadcasted, long distance vocal or musical sounds with unequalled distinctness. Fine tonal qualities and extreme sensitiveness, are features of this high-grade piece of apparatus.

For the past eight years its makers have been recognized leaders in manufacturing professional Radio Head Sets. Back of that is twenty-eight years' service in building voice transmission apparatus for telephone companies. Stromberg-Carlson Telephone Receivers and Radio Head Sets are known in every part of the world where telephones and radio stations are installed.

This wide experience has enabled us to produce a new, perfected Radio Head Set, a high-grade apparatus at a moderate figure—combining the important requirements of sensitiveness, with convenience and comfort for the wearer.

The No. 2-A Radio Head Set comprises four distinct units; two receivers, head band and 5 foot cord.

THE RECEIVERS

Receivers are equipped with a one-piece bi-polar permanent magnet, of high grade magnet steel; provided with phenol fiber spool heads, slotted soft iron pole pieces, corrosion proof diaphragm, enameled copper wire coils. All parts are encased in a receiver shell of cast-non-magnetic insulating material, that is unaffected by either moisture or temperature changes. Each coil is wound to 500 ohms. The coils are connected in series. This gives a combined resistance of 2000 ohms for the 4 coils of a No. 2-A Radio Head Set.

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A head band is furnished of the spring wire type, covered with heavy brown webbing, correctly shaped, light in weight and comfortable to the operator. Knurled thumb screws are provided on both ends to permit locking the adjustment after it is once fitted to the head. Exposed metal parts are nickel finished. Another feature of merit, in regard to the design of this head band, is a provision for separating the receivers which permits two observers listening in on a circuit simultaneously with but one Stromberg-Carlson No. 2-A Head Set. This accomplishment is simple because the Head Band is provided with spring stirrups which engage the receivers, in such a manner, that either receiver may be disengaged from the head band by simply spreading the stirrups.

THE CORDS

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Sold by dealers or direct by us.

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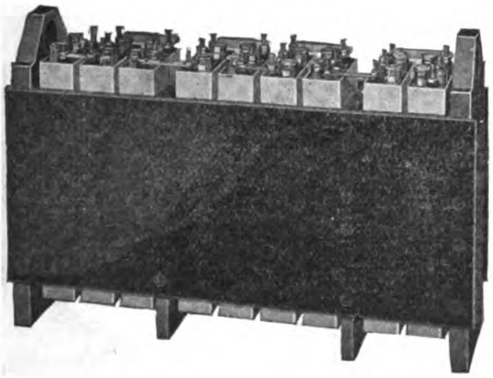

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Advantages of the Edison Radio Battery

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It is clean and gives off no noxious fumes.

It requires little attention.

Obviously, from its principle and construction, there can be no sulphation, sedimentation, corrosion of terminals or separator troubles.

There is nothing about it to "buckle" or crack.

It can be completely discharged without injury.

It can be put on charge at any time regardless of how little or how much of previous charge has been used.

It can be taken off charge at any time and used, whether fully charged or not.

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If charged when polarity is accidentally reversed; or if accidentally short-circuited, it is not injured.

The Edison Radio Cell operates silently. There is no "frying" or other noises to interrupt when receiving.

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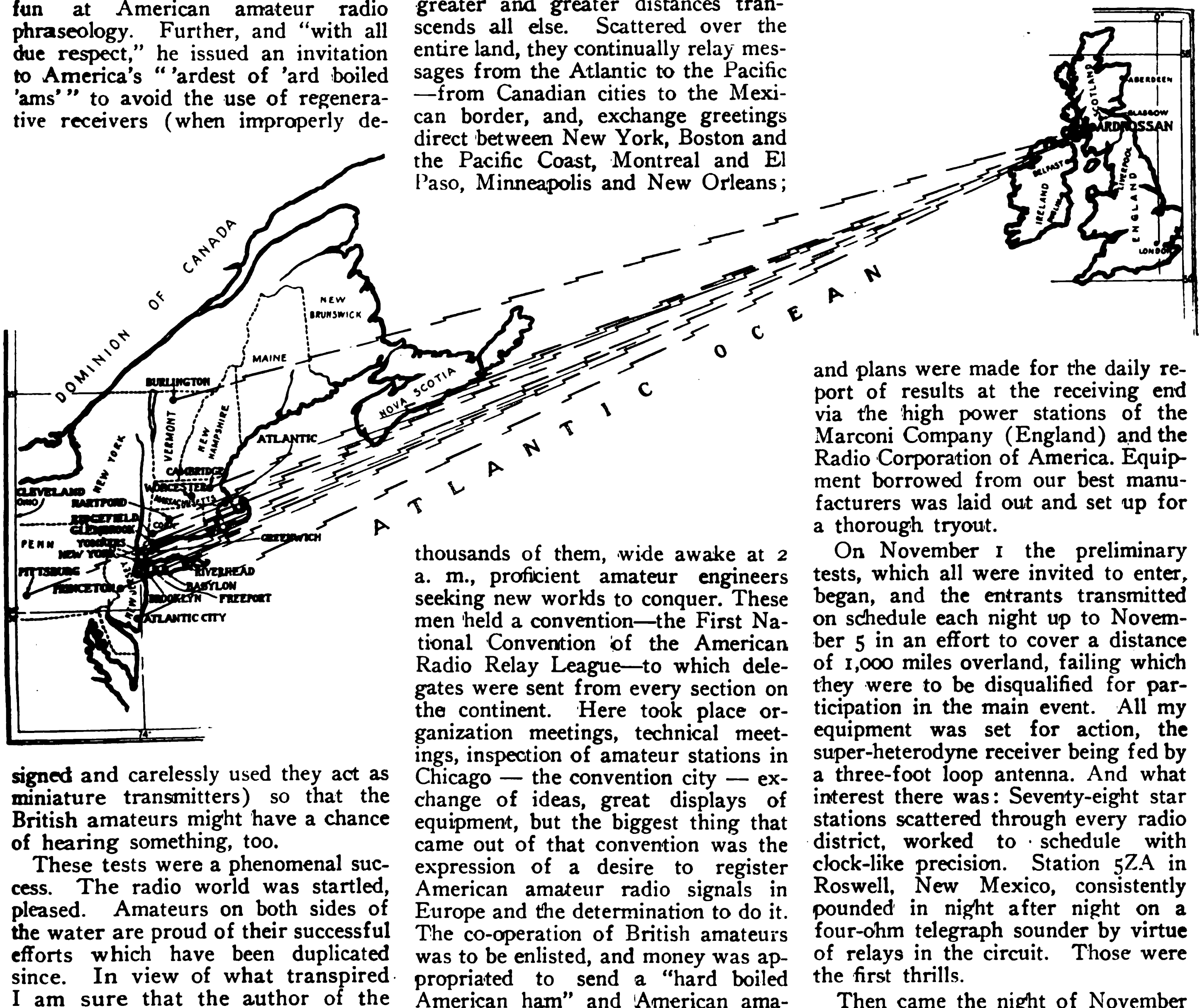
EDISON STORAGE BATTERY COMPANY
Department A Orange, New Jersey

The Far Call

The Phenomenal Success of the Amateur Trans-Atlantic Tests

By Paul F. Godley

ON its editorial page of November 30, 1921, The Star (London), published an article which was intended to inform the public of Great Britain on "the prospects of the new trans-Atlantic wireless tests." The author of this article showed a decided satirical vein and took advantage of a great opportunity to poke fun at American amateur radio phraseology. Further, and "with all due respect," he issued an invitation to America's "'ardest of 'ard boiled 'ams'" to avoid the use of regenerative receivers (when improperly designed and carelessly used they act as miniature transmitters) so that the British amateurs might have a chance of hearing something, too.



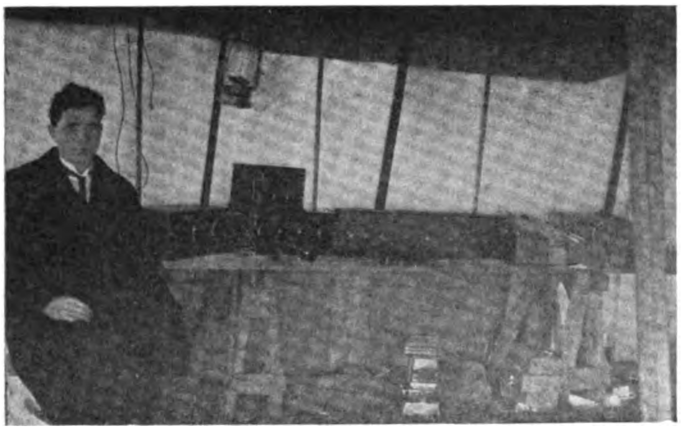
These tests were a phenomenal success. The radio world was startled, pleased. Amateurs on both sides of the water are proud of their successful efforts which have been duplicated since. In view of what transpired I am sure that the author of the article mentioned above would now join me in registering amusement at his earlier efforts. But, he performed for me a service. The title of his article was "The Far Call." To me, those words are filled with romance — the romance of strange, fascinating, delightful adventure; a vision of the spirit of youth, vital eagerness, far-darting imagination, and, I ask you, where is there the man who breathes whose intelligence is not held fascinated by speculation upon the limits to which amateur radio signals may be sent?

There are in America 20,000 radio amateurs whose interest in the transmission of small radio signals over greater and greater distances transcends all else. Scattered over the entire land, they continually relay messages from the Atlantic to the Pacific —from Canadian cities to the Mexican border, and, exchange greetings direct between New York, Boston and the Pacific Coast, Montreal and El Paso, Minneapolis and New Orleans; thousands of them, wide awake at 2 a. m., proficient amateur engineers seeking new worlds to conquer. These men held a convention—the First National Convention of the American Radio Relay League—to which delegates were sent from every section on the continent. Here took place organization meetings, technical meetings, inspection of amateur stations in Chicago — the convention city — exchange of ideas, great displays of equipment, but the biggest thing that came out of that convention was the expression of a desire to register American amateur radio signals in Europe and the determination to do it. The co-operation of British amateurs was to be enlisted, and money was appropriated to send a "hard boiled American ham" and American amateur equipment to Europe by way of insurance that it would be done if it were possible. Greatly honored, it was my good fortune to be chosen as that man. This is a story of my adventures.

After exchange of telegrams between my home and the convention above referred to, there ensued long consideration of methods and equipment, study of maps and globes and search for information concerning the difficulties to be encountered. Communication was had with our Department of State, and with Mr. P. R. Coursey, Editor of Wireless World (London), who represented the British amateurs. Arrangements were made for a British Post Office permit of operation, and for transportation, and plans were made for the daily report of results at the receiving end via the high power stations of the Marconi Company (England) and the Radio Corporation of America. Equipment borrowed from our best manufacturers was laid out and set up for a thorough tryout.

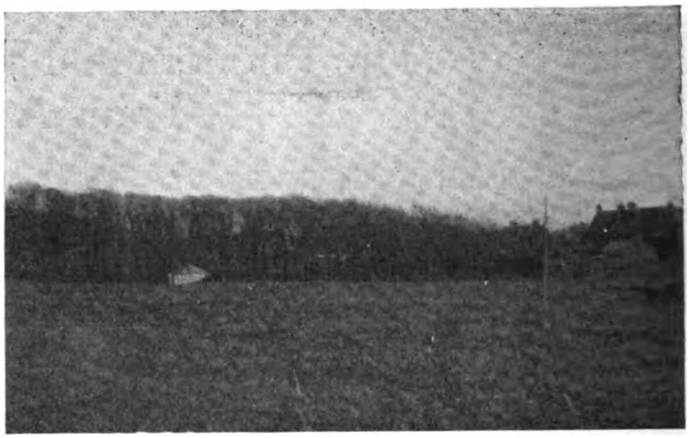
On November 1 the preliminary tests, which all were invited to enter, began, and the entrants transmitted on schedule each night up to November 5 in an effort to cover a distance of 1,000 miles overland, failing which they were to be disqualified for participation in the main event. All my equipment was set for action, the super-heterodyne receiver being fed by a three-foot loop antenna. And what interest there was: Seventy-eight star stations scattered through every radio district, worked to schedule with clock-like precision. Station 5ZA in Roswell, New Mexico, consistently pounded in night after night on a four-ohm telegraph sounder by virtue of relays in the circuit. Those were the first thrills.

Then came the night of November 14 with a farewell dinner and with all arrangements completed I sailed for England. Twenty-five contestants had qualified—two more were added later. The ten test nights—December 7 to 16, inclusive—had been divided into two periods, 7 P. M. to 9.30 P. M. Eastern Standard Time, and 9.30 P. M. to 1.00 a. m. The first half of the night was intended as a free-for-all and was divided up into 15-



Courtesy A. R. R. L.

Apparatus in tent at Ardrossan. Note the lantern (upper left) the heating plant consisting of a small oil stove (bottom center) and the thermos bottle (lower right)



Courtesy A. R. R. L.

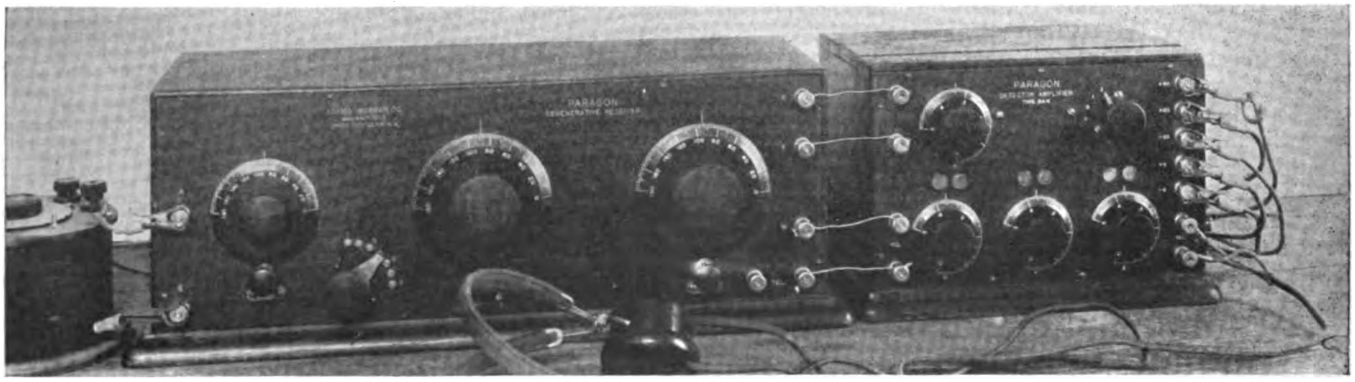
Location of tent and a view of one end of the antenna which was 1300 feet long

minute periods, one period being assigned to each of the nine American inspection districts and one to the Canadian stations. These periods were rotated each night, so that if there was a better chance at one hour than another all districts would have a shot at it. The second half of the night, from 9.30 P. M. until 1 A. M., was assigned to those individual stations which had qualified in the preliminaries. The time was divided into fourteen periods of 15 minutes each, and during each of these periods only individual stations were to transmit. Two stations were assigned to most periods, although some periods found three stations transmitting, care being taken that the stations were well separated, and their wavelengths about the same to obviate too much adjustment on the receiving end. A secret code word of five letters was assigned to each of the stations which had qualified, with instructions not to open the letter containing the code word until the first night of transmission. A copy of these code letters was handed to me in a sealed package for delivery to Mr. P. R. Coursey in England, who was to be referee throughout the tests, and to whom I was to make all reports of reception in the same manner as did the British amateurs, although, in case of my reports, Coursey was to send them off to the States via the Marconi Station MUU, Carnarvon, Wales, from which station they were to be slowly broadcasted so that American amateurs might hear, after which the Radio Corporation station WII at New Brunswick, N. J., was to slowly repeat them for the benefit of those amateurs having less sensitive receivers.

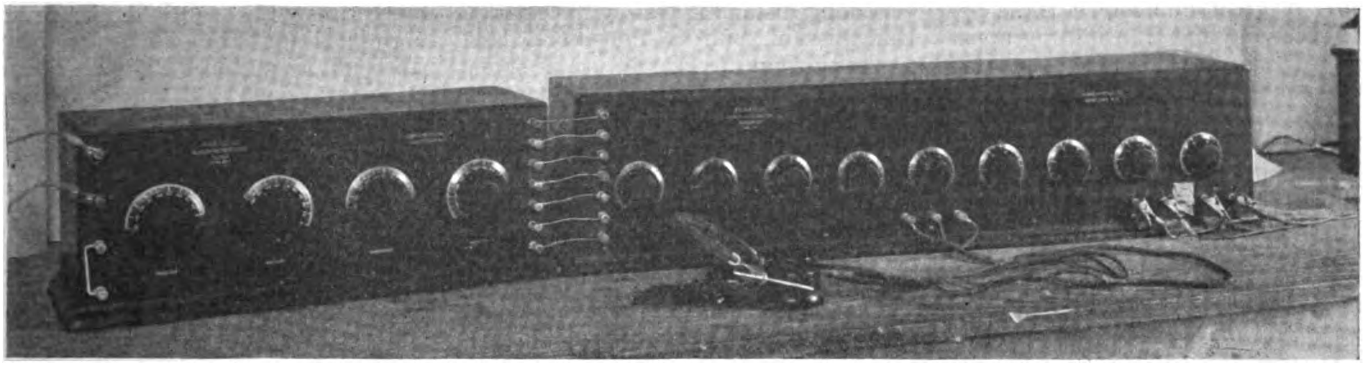
It was quite apparent that both amateur and professional interest in this great sporting event was running high. The great commercial trans-Atlantic stations were placed at our disposal each morning during the period of the tests through the efforts of Mr. W. A. Winterbottom, Traffic Manager of the Radio Corporation of America. At least a dozen engineers had come forward with offers of assistance. Both Mr. Winterbottom and Mr. E. E. Bucher had given me letters of introduction to the principals of the Marconi Wireless Telegraph Co., Ltd., in England, and had written these men outlining the project and soliciting their assistance. The Radio Corporation had also loaned equipment in the shape of UV-200 detector tubes. Baldwin phones were also included and later proved their worth. Burgess batteries, a General Radio Precision wavemeter, A-P amplifier tubes, and Paragon receiving tuners and amplifiers were all within the trunks on the dock on the night of November 14, at which time a group of prominent amateurs were welcoming me to a very enjoyable informal dinner at the Engineers' Club, New York City, in order that they might offer every encouragement and bid me God-speed.

I shall never forget that night. There were present Messrs. Maxim, Warner, Schnell, Hebert, Camp, Stewart, Service and Goette, all officers and members of the Board of Direction of the American Radio Relay League; Mr. J. Andrew White, Editor of THE WIRELESS AGE; Edwin H. Armstrong, G. H. Burghard, President of Radio Club of America; P. H. Boucheron, Director of Publicity, Radio Corporation of America, and W. S. Smith of the Hartford (Conn.) Courant. This affair was a regular old-time get-together and I was having a great time until someone started on a line of talk which ended up with Armstrong's telling the bunch that he would stake his professional reputation on my success, and with White's assurances to all assembled that there was nothing to it—it was a cinch. I wasn't so all-fired sure about it, and I began having visions of coming back to the States to find a nice little hole to crawl into and pulling it in after me.

At noon on the following day the "Aquitania" slid down the North River and I was off. Prior to sailing, the vessel and the dock had been swarmed by a group of very earnest amateurs who had come to bid me farewell. After these men were put ashore we had great fun signaling back



A view of the special regenerative receiver hooked up with a detector and two-step amplifier



Front view showing the control dials of the super-heterodyne tuner and amplifier

and forth through the din and confusion, and it was in this way that I learned that H. H. Beverage, receiving engineer for the Radio Corporation, was aboard, and I met him for the first time as he leaned over the rail and the "gang" on the dock looked on.

During the voyage across, what time was not spent sleeping, found me either talking to Beverage or in the radio room, which had been thrown open to me as a result of the courtesy of Mr. H. H. Short, Superintendent Marconi International Marine Communication Co., Ltd. It was impossible to do a great deal of listening on the short wavelengths on account of the large amount of radio traffic handled by the bigger vessels, so I had to be satisfied with occasional snatches of 200-meter stuff and the many radiograms which came in via the commercial stations wishing me bon voyage and all success. Those radiograms certainly put it up to me to make good. One from the editor of this magazine read: "Just an added slap on the back, old man, to emphasize my sincerest wish that this trip of yours will go down in radio history," while one from the officers of the American Radio Relay League read: "Bon Voyage: The entire radio world is pulling for you." This was to be no lark! It would never do for me to disappoint that enthusiastic crew of radio men back there. There was only one course open to me — that was the course which, beyond all peradventure of a doubt, would bring in signals, and I began to retrace plans, to amend here and add there.

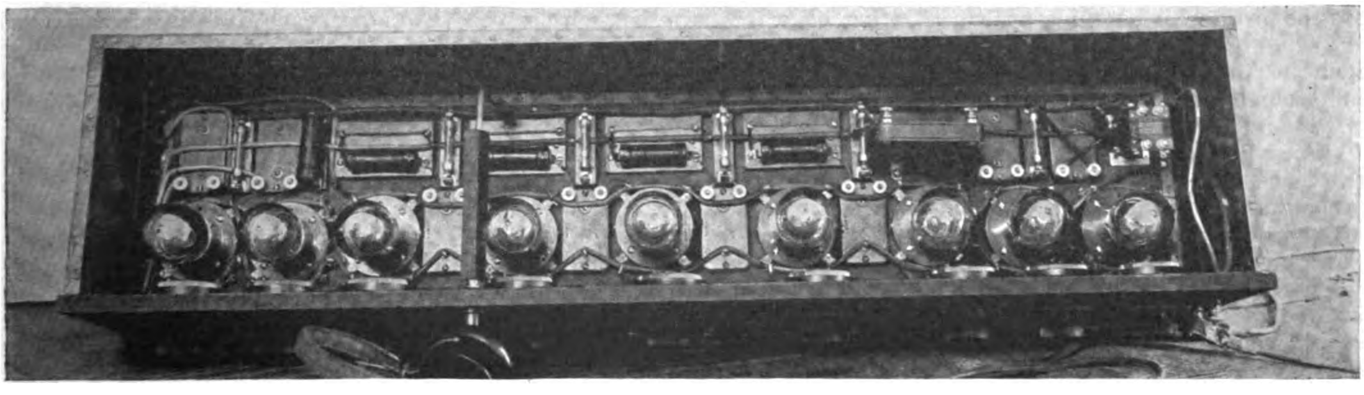
Even European amateurs were all wound up on this thing, too. In reply to a radiogram of greeting to a prominent French amateur came: "Wish you complete success," and when I reached the dock in Southampton I found there waiting to assist me through the customs, Mr. H. J. Tattersall, Superintendent of the Marconi Company in Southampton. The same interest was shown in London when I arrived. I was introduced to all the prominent radio men thereabouts before forty-eight hours had elapsed; had spoken briefly before the Wireless Society of London; had had a mixed debate with regard to the amateur policy of the British Post Office; had listened to an extremely interesting lecture given by Dr. J. A. Fleming before the Royal Society of Arts, and had chatted with such men as Senatore Marconi, Admiral Sir Henry Jackson, President-elect of the Wireless Society of London; Mr. Campbell-Swinton, past president of the society; Prof. E. W. O. Howe, Mr. E. K. Shaughnessy, Chief Engineer, Wireless Section of the British Post Office; Mr. F. Hope-Jones, Chairman of the Wireless Society of London, and many others.

It was at the close of Dr. Fleming's lecture that I met Senatore Gugielmo Marconi. I was greatly pleased at the interest which he showed in the tests which were about to be carried out. He asked many questions concerning my plans and concerning amateur and broadcasting progress in the U. S. A. He expressed every hope that the tests would be successful, and said he saw no reason why they should not be. As I was about to leave him, he asked that I carry back to the amateurs in the United States his good wishes, because, as he said: "You know, I too, am but an amateur."

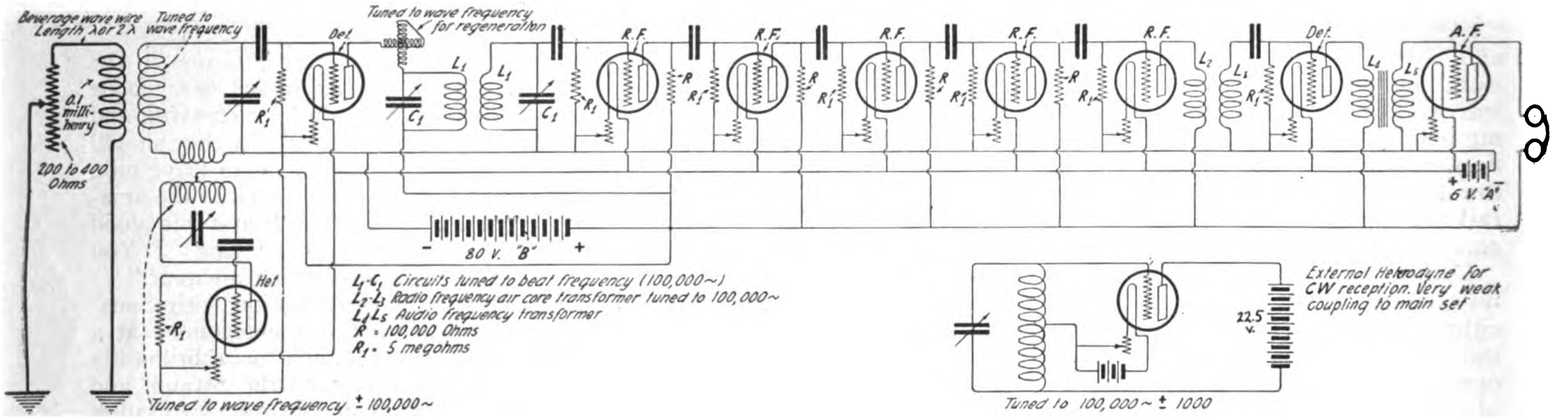
After this conversation with Senatore Marconi, I was entertained at a little informal dinner in a brilliantly lighted restaurant on the Strand, and everyone present, including two ladies who were qualified as amateurs, toasted the success of the amateur trans-Atlantic tests.

Notwithstanding the wonderful hospitality, I am quite sure there wasn't one of them who thought that we had a chance of putting the thing over. I am also sure that many of them had great difficulty in figuring out how any group of men could take so keen an interest in such a thing as this — an interest which would lead them to spend good time and good money in an effort to carry through such experiments. But they were good sports, because they did their share in every possible way, and if they did finally come to the conclusion that there were possibilities of success, I believe that it was due, in large measure, to the great efforts which they saw had been made by all concerned on this side. And I think they surprised themselves a bit, too, when British amateurs copied at least nine American stations.

There are, in Great Britain, approximately, 5,000 amateurs interested in



Interior view of the super-heterodyne tuner and amplifier showing the arrangement and construction of the apparatus that make up the set


Beverage wave wire Length λ or 2 λ
Tuned to wave frequency
0.1 milli-henry
200 to 400 Ohms
Det.
R_1
Tuned to wave frequency for regeneration
L_1
C_1
R.F.
R
R_1
L_2
L_3
L_4
L_5
A.F.
+ 6 V. "A" −
− 80 V. "B" +
Het
L_1-C_1 Circuits tuned to beat frequency (100,000~)
L_2-L_3 Radio frequency air core transformer tuned to 100,000~
L_4 L_5 Audio frequency transformer
R = 100,000 Ohms
R_1 = 5 megohms
Tuned to wave frequency ± 100,000~
22.5 V.
External Heterodyne for CW reception. Very weak coupling to main set
Tuned to 100,000~ ± 1000

The super-heterodyne circuit diagram and some values used in the set at Ardrossan

radio. A great number of these operate receiving and transmitting apparatus. There is, however, no relay work going on. The British Post Office regulations prohibit it. The Post Office officials hold that to permit it would cause a decrease in the revenues which accrue from the telegraphs. The attitude of the general public in Great Britain and the misconceptions under which they are laboring, is very well illustrated by a lengthy editorial which appeared in the Glasgow Herald on the morning of the day when I sailed for home. In part, it reads:

"The position of the wireless amateur in this country has been sharply accentuated by the visit of Mr. Godley, the representative of the American amateurs, who has been carrying out trans-Atlantic low-power wireless tests at Ardrossan. Mr. Godley came over here with a specially sensitive receiving instrument which it was anticipated might record even messages transmitted from American private stations, the power of which is restricted to one kilowatt. The anticipation was realized, messages having been duly taken in from over 30 different amateur stations in the United States and Canada. This is a very remarkable achievement, which certainly does, in a way, open up a very alluring prospect of regular wireless intercommunication between British and American amateurs. But a great many changes will have to take place before the prospect is anything but remote. The position of the wireless amateur in America is altogether different from that of his British confrere. He is, for example, just a hundred times better off in regard to power, since our Post Office at present only grants licenses to use power up to ten watts, and ordinarily the use of an amateur transmitting station "on this side" is restricted to a radius of ten miles. The one kilowatt set, with which American amateurs are privileged to work, is capable, under every-day conditions, of covering very long distances even with "spark" transmission, and is not much less powerful than the gear in use at some of our coastal stations. If amateurs in this country were allowed to use power up to a kilowatt, the whole position of British commercial wireless would be greatly compromised and a good deal of the apparatus and machinery which the Post Office has, under considerable financial restrictions, installed since the Armistice would probably have to be scrapped in order to provide gear capable of effectually dominating amateur "interference."

"America, no doubt, knows her own business best in regard to wireless. It is undoubtedly an interesting, and possibly beneficial circumstance that American amateurs can freely communicate with one another, and listen to concerts and speeches delivered perhaps some hundreds of miles away. But what is good for America is not necessarily good for us, and we must not blame our Post Office if it exercises very great caution indeed, in following the American Government's example in extending amateur wireless facilities. The post master general in this connection acts as trustee for the public and his responsibility is threefold. First, he must see to it that the efficiency of his own wireless service is not in any way compromised by amateur interference; secondly, he has to consider the case of the various ship and commercial stations to which he grants licenses; thirdly, there is no getting over the fact that wireless is at present a valuable government monopoly, which, in the near future, will probably be developed to a very high pitch of revenue earning capacity. As a nation we can ill afford the marked depreciation of the income to be derived from telegraphy, both with and without wires, which will inevitably ensue if British wireless amateurs obtain all the facilities enjoyed by the same class in America without official let or hindrance."

They think a great deal more than they say, too. They even accuse us of interfering with "SOS" calls. I wish to go back and straighten these newspaper editors out on the thing. They're all wrong as we well know, and in a year or two they will know it, too, but under the circumstances, the British amateur has a stiff climb ahead of him.

Among those who were first to greet me in London was P. R. Coursey, Editor of the "Wireless World," and Commander Frank Phillips, Radio Engineer and prominent in amateur circles. Coursey had already arranged for a permit for operation, and this permit restricted me to the home station of Mr. Phillips. As soon as I could get my bearings, all equipment was taken to Mr. Phillips' home, set up, and put into operation.

We American amateurs have seen and read a great deal that has been written in the British Radio magazines concerning those obnoxious ones who insist on allowing their regenerative receivers to oscillate. Until I had listened in near London on some of the 10-watt radiophone "concerts" I never before fully appreciated the meaning of the phrase "radio concerts." Then I knew. A radio concert near London is a concert of listeners, all listening to the same 10-watt radiophone about 40 miles away, and all allowing their receivers to operate on or near the zero beat. That is, their receivers were oscillating, and what one heard instead of the phone was about fifteen or twenty faint flute-like notes, each of a different pitch. It is needless to point out that this entirely spoiled, in most cases, the speech or the music, and this was usually true during the musical programs sent out by a Dutch Radio Company at the Hague on Sunday afternoons. We, here in America, are beginning to get that, too, particularly those of us who live in the congested areas, and I have been speculating for many months on how far those types of receivers which do radiate considerable amounts of energy when allowed to oscillate will offset the value of the radiophone concerts in these congested districts remote from the source of the concert, and how soon it will be found necessary (if we are to get the most out of the broadcasting programs), for steps to be taken to put a stop to the thing.

During my entire first visit to London, the fog was so thick that it could be cut with a knife. You, no doubt, have heard of the "pea-soup" fogs. They originate in London, and I was forcibly fed on one for about 10 days. And that reminds me of a conversation which I listened in on while at Wembly Park, which took place between the operator at the Croyden airdome and one of the London-to-Paris planes. The plane was in-bound. The fog was thick. The pilot's name was Robinson, and he was very keen on landing at Croyden notwithstanding that orders had been passed out to him earlier to land at a point some 25 miles south of London. The conversation ran something like this:

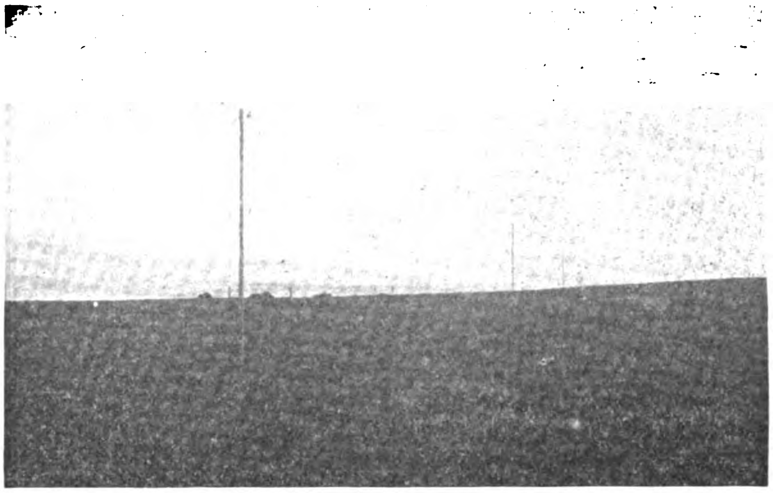
" 'Allo R-r-r-r-robbie; Cr-r-r-royden callin'; 'Allo R-r-r-r-robbie; Cr-r-r-royden callin' and s-v-itchin' over."

" 'Allo Cr-r-r-royden; 'allo Cr-r-r-r-royden; I expect to land at Cr-r-r-royden; R-r-r-robbie s-v-itchin' off."

" 'Allo R-r-r-robbie; 'allo R-r-r-r-robbie; Cr-r-royden here; you are positively forbidden to land at Cr-r-r-royden; you are positively forbidden to land at Cr-r-r-royden; Cr-r-r-royden s-v-itchin' off."

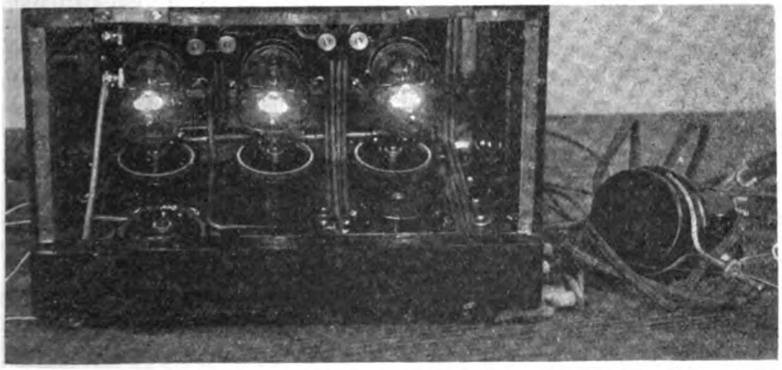
Apparently Robbie was a daredevil. He did land at Croyden.

After a little of this radiophone stuff and listening in on various wavelengths to all the strange commercial station calls up and down the European shores, we settled down onto 200 meters to see what it was like. And what do you suppose we found. Static! Gobs, and gobs of it. And harmonics, whole orchestras of them! Home was never like this. One could read nearly all the high-power stations in Europe on or near two hundred meters. There was POZ, Nauen; FL, Eiffle Tower, Paris, MPD, Poldhu, England;—all the high-power stations in Christendom whistling and bubbling and wheezing away. Through five nights of this we sat and listened—or rather Phillips sat, and I stood and listened and shivered, with a gas fire going full tilt in the fire place, and never a peep from the U. S. A. Phillips took quite a fancy to the receivers, but carried a knowing smile which meant to me "Well, old top, you'll learn something about what we were up against during the last tests."



Courtesy A. R. R. L.

A perspective view of the extensive antenna and surrounding flat country



Interior view of the detector and two-step amplifier showing the UV-200 and 201 Radiotron tubes

I must confess, frankly, that I wasn't at that time very much in love with the job ahead of me. I was worried — and deucedly cold besides, and the only way I could jolly myself along was to paint mental pictures of a beautiful flat of land by the sea on the Scottish coast in one corner of which stood a cozy little cottage all nice and warm inside; a long table in one room which faced the West; and a beautiful view, through the window, of the sea-side flat across which stretched a business-like Beverage Antenna. And, I carried this picture around with me until, finally, there was nothing left for me to do but go and look for the original. Anything was better than being forced to live through the days and nights with a feeling that it would be the same old story of static and harmonics, harmonics and static, over and over again.

And, too, I had a feeling that if worst came to worst, rather than face the London crowd again, I could jump right off the Scottish shore and swim back, land in Newark bay, and slink across the Jersey meadows in the dark of the night.

On the other hand, I disliked to run away from Coursey, Phillips et al. In their place, I think I would have been somewhat disappointed. We had planned that various amateurs in the London area would sit in with me during the several nights, and I'm sure I missed a great deal. But signals were the thing, and all manner of fellowship could never, never make up for the lack of them.

After negotiations, which required some effort with the British Post Office, regarding an alteration of the operating permit to cover some location within a radius of 40 miles of Glasgow, it was granted. It is likely that the hesitation shown was due to the unwillingness on the part of Post Office officials to weaken their position with regard to amateurs. Any favors shown me would most certainly encourage British amateurs to ask greater leeway. Any success which I might have would most certainly encourage British amateurs to present a bolder front than at any time in the past. But, knowing this, and thinking as they do that amateurs should have no place under the sun, still permits were granted. If a certain honorable gentleman, Mr. J. W. Wissenden by name, and who is by occupation assistant secretary to the Post Master General, ever puts in an appearance in the States, and I learn of it, I shall see to it that he gets a permit to do anything he wishes, 'Antis notwithstanding.

Before leaving for Scotland conferences were held with Coursey, which covered methods of reports to him and his dispatch of them via MUU. This brought us in touch with Mr. Otto Rochs, Traffic Manager, Marconi's

Wireless Tel. Co., Ltd., who held that there was nothing connected with his service too good for amateurs, and his performance was entirely in accord with his views. There were others working for us, too. Arrangements were made from London with the Marconi Co. for the use of materials, men and the company's motor truck in Glasgow if this were needed. This assistance was not solicited and came as a result of the keen interest taken in the whole scheme by Mr. W. W. Bradfield and Mr. Allen, joint general managers of Marconi's Wireless Tel. Co. About this time I also met Mr. H. J. Round, Marconi Receiving Engineer, whose contributions to the art are familiar to all amateurs. He, too, was keenly interested not only in the trans-Atlantic tests, but in everything that we are doing on this side, and I took advantage of him to the extent of learning all I could from him.

The night of December 1 found me aboard train and off for Aberdeen on a little side trip which it was hoped would bring to light first-hand information concerning the reported reception at that point of station 2QR. For the first time since reaching England I was cozy and comfortably tucked away in the berth of a first-class sleeper on a through express. The compartment was steam heated, and things were so arranged that one could lie in bed and turn steam on or off (I left it on), open or close ventilators, start an electric fan, ring for porter or take a drink, and in the morning a tray containing tea and biscuits was brought in. Home was never like that either. And, what a sad contrast between the comforts on this train and what was to come!

After spending a little time in Aberdeen, which, by the way, is the most beautiful city I ever hope to see, I booked passage to Glasgow, where I arrived Saturday evening, December 3. I greatly missed the berth in the first-class express and made great haste to get into flannels and between the covers in a heatless room, while on the following morning I toured the hotel in search of a fire and found one — just one — which was in an open grate in the lounge room. To this I stuck as closely as possible until Monday morning.

Information gathered in Glasgow concerning the layout in the coastal towns and Ardrossan in particular completely dispelled the cozy cottage part of my idealistic picture. There was no way out of it, so arrangements were quickly made for shipment of a 12 by 18-foot tent by express train, while through the efforts of Messrs. Carswell and Sutherland of the Marconi Marine Communication Company wire, insulators, storage cells, etc., were lined up and started on their way. Arrangements were also made to secure the services of the checking operator, Mr. D. E. Pearson, Chief Inspector of this company in the Glasgow district. Both Carswell and Sutherland took great interest in the little game I was to play, and without their assistance I might well have had a different tale to tell. Carswell lined me up with the town clerk in Ardrossan, a Mr. Wood, who was a personal friend of his, while Wood, together with Carswell who joined me in Ardrossan on the following day, saw to it that I got started properly with the city officials who vise-ed my credentials. Both Carswell and Wood spent the greater part of the day in helping me locate the station site. Pearson joined us after lunch, and trunks, tenting, and various other material having arrived on schedule, construction of the station began by mid-afternoon on Tuesday the 6th, with prospects of having it in operation by midnight. The weather, however, was all of the wrong sort. The selection of the site, the transportation of the material to the site, and the erection of tent and antenna were all accomplished amid a downpour of rain. By the time the tent went into position darkness had fallen, and the tent had not been in position many minutes ere a great gust of wind had flattened it and also our spirits. The weather and the darkness finally beat us, forcing an abandonment of the work until the following day. Two hours and twenty minutes of listening in that night — the first of the tests — was effected by using a Western Electric "peanut" tube supplied by Burgess batteries both on the plate and filament. Nothing was heard but static and ship stations, though we listened in on shorter wavelengths.

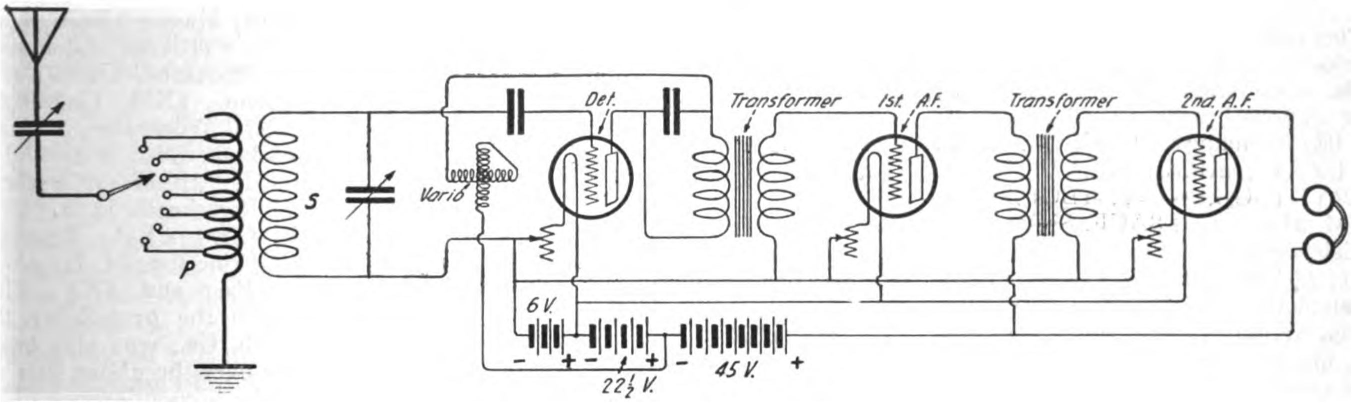
On Wednesday the 7th, the 1300-foot stretch of line was completed, the wire being supported by 2 x 4 inch posts 12 feet high, and laid out to point directly toward Chicago. The wire was grounded at the distant end through a non-inductive resistance (250 to 400 ohms) and at the home end through a variable inductance of the order of 0.1MH in value. This constitutes the Beverage antenna. For any given wavelength the wire should be one, or two even wavelengths long. Arrangements were made to change the length of the wire, it being necessary in each case to shift the non-inductive resistance and ground connection from one supporting pole to another. Signal potentials built up in such a wire are approximately equivalent to those which would be built up in a vertical wire one-tenth (at most) of its total length. When working at 200 meters and having a wire length of approximately 650 feet (one wavelength), signal potentials produced in the wire would be equivalent to those produced in a vertical wire 65 feet in height, or, if the full wire were used, 130 feet in height, at that wavelength. Furthermore, the system is highly directional, and eliminates a great portion of the atmospherics and interference coming from directions other than those from which one wishes to receive. That this condition did exist was proven frequently by comparison with a small vertical wire supported by a nearby tree. Static to signal ratio in all cases was decidedly better on the Beverage wire.

Within the tent the regenerative receiver and super-heterodyne receiver were set up together with all accessories which were found to be in first-class condition. Circuit diagrams and photographs of this equipment accompany this article. Reference to the regenerative receiver circuit is unnecessary inasmuch as it is familiar to the great majority of all amateurs, while the circuit diagram of the super-heterodyne is self-explanatory insofar as constants of the circuit are concerned. For a discussion of the action of the super-heterodyne receiver the reader is referred to previous articles by the writer which have been published in THE WIRELESS AGE.

At 11.30 P. M. all outside work had been completed and equipment arranged inside, whereupon the apparatus was gone over and put into operation. First the radio-frequency amplifier used with the super-heterodyne receiver was started up and time signals heard, without antenna, from both FL, Eiffle Tower, Paris, and POZ, Nauen, Germany. Next, the tuning equipment, which formed the super-heterodyne, was gone over in connection with a short wire which had been thrown into a nearby tree, and all circuits were adjusted while working on the multiude of 600 meter signals which were coming through. VCE, Cape Race, was there, and most as strong as any of them, and I took this as a good omen. Finally, the Beverage wire was thrown in, preliminary adjustments made at both ends of the wire, and tuning started, the first signals recorded being the host of harmonics from the high-power stations, although these were not as bothersome as was the case near London. Search for short-wave amateur signals began at 1 A. M.

Exactly 33 minutes later the universe cracked wide open! In one magic moment Scotland's erstwhile gloomy shores became a haven of rest! Muscle soreness, soul sourness, fatigue and doubt vanished, and my unexpectedly difficult but insistent duty became a joy forever! Cold rains then were as liquid sunshine: boisterous, cutting winds as balmy, heaven-sent breezes. Nothing in the whole sad world could possibly be wrong — nothing, for an American amateur signal was piling in on us and rising in strength until at 1.42, in a very positive manner, his 60-cycle synchronous spark spelled out a message to someone that he would "see him later" and plastered the call letters 1AAW where the whole world might read!

Perhaps it was well that something happened shortly which allowed the charges to "leak off our grids." I had great difficulty in retaining composure. The lid was due to come off! After "camping" on this fellow's wavelength he came in again at 1.50, but was too weak at that time to be read through the heavy static, and having heard no more of him up to 2.35, I began to smell a rat, ran down to look over the line, and returned in a few minutes to report a pole broken off short, a couple of others badly out of line and the wire on the ground at a point about 700 feet from the tent. We shut down, grabbed pick and shovel, and mushed out into the tempest to repair the damage. Thirty-five minutes later we had shaken off as much of the slime as possible and were back on the job. Atmospherics were coming heavier, and nothing more was heard of amateur signals, although Cape Race was buzzing merrily away as we shut down at 6 A. M. But, I had no complaints. Twenty-one consecutive hours' work, no matter what the conditions, or when, or where, can ever again bring to me the supreme satisfaction that came then.



Circuit diagram of the special regenerative receiver and detector with two steps of amplification

The strange, and, I should say, even sad sequel to this wonderful good fortune runs as follows: Due to error in the use of codes between Coursey and myself, station 1AAW was broadcasted to the U. S. A. as being 1AAY. This was not straightened out until 48 hours had elapsed, and, after being straightened out, it was found impossible to locate the sender. Station 1AAW in Roxbury, Mass., had not been in operation for some time, although investigation on the part of the officers of the American Radio Relay League brings to light the information that someone in the Boston district has been using that call. Whoever he is, I hope that sometime he may find courage enough to come forward and admit it. It's a serious offense to appropriate a call and operate in violation of the law, but I would like to shake that fellow by the hand, regardless.

After a good long sleep which was split up, due to the necessity of properly repairing the line during the afternoon of the 8th of December, we got out to find the heavens filled with stars and a bright moon shining. There had been high south-westerly winds during the day with plenty of rain, but now the wind had shifted to the north-west. After two or three hours of listening without further result, we were forced, due to the cold, to make a shift in the arrangement of the equipment in order that we might take full advantage of the heat which our tiny oil stove threw out. Fortunately there was enough canvas left over from putting the tent together to make it possible for us to get a long strip of canvas at our backs, thus pretty well shutting us into one corner of the tent. At this time we also rigged up our lantern so that greater advantage might be taken of its poor light. Subsequent to the changes another two and a half hours of listening brought continued lack of results, and it was necessary to report "no signals."

On the night of December 9 the weather had again gone very wet, and the winds had grown considerably heavier. Atmospherics were also heavier than the night before, being of about the same order as on the night when 1AAW was heard. At 12.50 A. M. on the morning of the 10th, after listening for sparks, we switched over for continuous wave reception and immediately picked up station 1BCG on 230 meters. We had some difficulty with him due to atmospherics and a very bothersome harmonic from the station at Clifden, Ireland, 150 miles away. Both these were nullified to a great extent by various adjustments of both the apparatus and the line wire. During the adjustments we lost 1BCG several times. These adjustments were terminated at 1.33 A. M. and we began logging him. He called "PF" several times, his sending being very steady, but fading out for 30 seconds every three or four minutes. At 1.59 A. M. he called station 2BGM, said "Phone us now" and shut off.

This was the real stuff! No funny business here at all, and for a second time I ran the gauntlet of a whole colony of real thrills. Some radio history was being written in that miserable tent. Oh! how I wished for a transmitter. with which to make more of it!

Nothing further was heard of 1BCG this night. We shut down at 6 A. M. and talked it over. Signals had been so steady and so seemingly dependable that both Pearson and I wondered what power he might be using. Pearson was quite sure it must be several kilowatts, and I couldn't say no. Subsequently we learned that the input was 990 watts.

At 7 A. M. we, for the first time, listened in on MUU as he sent "Godley's message" through. That was indeed a pleasurable 10 minutes, for as I listened I pictured the thousands of eager listeners on "the other side" to whom these radioed reports would bring increased enthusiasm for this most wonderful game.

Failure to hear stations other than 1BCG on this night coupled with the great strength and steadiness of his signals brought about a lot of speculation on my part as to whether he was to be the only reliable signal to get through to us, and I concluded that he might very well be, so. I cabled him: "Send messages." This cablegram was horribly mutilated enroute. It reached Armstrong reading "Send mges." He took this to be some sort of a code word which I wished him to transmit in order that the British amateurs might be convinced that I didn't have a transmitter hidden somewhere on my person, and feeling that they should be shown he transmitted "MGES," and did it the whole night— or rather morning of the 11th.

His action, however, enabled further adjustments on the Beverage wire, which, taken with the conditions which prevailed, made of the expedition a *real* success, for on this night 18 different stations were logged, the secret code words being gotten from three of them, while dozens more were heard but not logged, either due to our inability to make out their weak signals through static—because of the number of stations working at one time and the resultant jamming—or because of the failure of stations, working locally, to use their station calls when transmission was ended. The stations heard Dec. 10-11 follow: 1RU sending "BPUSC"; 2FP, "HUZXJ"; 2BML, "FSXVG"; also 1ARY, 1BCG, 1BDT, 1BGF, 1YK, 1XM, 2FD, 2EH, 8ACF, 8XV, all of which were continuous wave stations, and: 1ARY, 1BDT, 2BK, 2DN, 3BP (Canadian), which were spark stations. Although we were unable to get his sign on account of jamming, 9ZJ came rolling through in good style as he worked 2EH.

The most remarkable feature was the strength of some of these signals. 1BCG's signals could have been heard easily 400 feet from the tent. Although we started out to see how far away he could be heard, we gave the idea up because of the rain which was coming down, and because of the time which would have been taken. 1ARY and 2FD (and later 2FP) almost equalled 1BCG as to strength, during one or two very short intervals. 1BDT, a spark station, although by no means as strong, almost equalled 1BCG in steadiness of signals during a long period. Two of the continuous wave stations were using powers of less than 30 watts!

On the following morning (December 12) excellent conditions continued until 3.30. Dozens of stations were going at the same time — a most wonderful procedure considering the distance. Stations logged up to 3.30 are as follows: 3XM, code LXCAM; 1BKA, 1XM, 1BCG, 2EH, 2FP, 2ARY, 2AJW, 1ARY, 1RZ, all C.W., and 1BDT, 3FB, and 2EL, which were spark.

At 2.52 A. M. station 1BCG called and started what proved to be the first message ever sent across the Atlantic via Amateur Radio:

> Nr. 1 de 1BCG words 12
> New York date Dec. 11, 1921
> (12-1921) to Paul Godley,
> Ardrossan, Scotland.
> Hearty congratulations.
> (Signed)
> Burghard, Inman, Grinan,
> Armstrong, Amy, Cronkhite.

Reception of this message was completed at 3 A. M. He said "bi two hours," which was the last heard of him, for, between 3 A. M. and 4 A. M. signals began to fall off rapidly and no readable signals from American amateurs were heard during the remainder of the tests.

Atmospherics grew worse, and continued rapidly worse during the remaining long nights. Summerlike weather began to prevail, winds growing heavier and finally terminating in a cyclone which had swept clear across the Atlantic to wreck shipping on the way, and to cause a tidal wave which backed water up to a depth of two feet in the streets of Hull. We escaped the fury of this storm by dismantling on the late afternoon of the 16th.

On the 19th, when I had reached London, I found that great enthusiasm was being shown as a result of the tests. Station 1BCG had been heard by 5 British amateurs, by a Dutch amateur in Amsterdam, and by an American ship operator in the harbor at Hamburg, Germany, and all newspapers in Belgium, France and the British Isles were featuring the story.

British amateurs had also heard 1AFV, Salem, Mass.; 1UN, Manchester, Mass.; 1RU, Hartford, Conn.; 1XM, Cambridge, Mass.; 2FP, Brooklyn, N. Y.; 2ZL, Valley Stream, L. I. They also report that it is probable that 1ZE, Marion, Mass., was heard, as well as station 2ZU, whereabouts unknown. Their report states that C.W. stations only were heard, which eliminates 2ZC whom they logged, since 2ZC is a spark station.

A complete list of stations heard at Ardrossan is as follows:

Spark—1AAW, not yet located; 1ARY, Burlington, Vt.; 1BDT, Atlantic, Mass.; 2BK and 2DN, Yonkers, N. Y.; 2EL, Freeport, L. I.; 3FB, Atlantic City, N. J.; 8BU, Cleveland, Ohio; 9ZJ, Indianapolis, Ind., and 3BP, Newmarket, Ontario.

Continuous wave—1ARY, Burlington, Vt.; 1BCG, Greenwich, Conn.; 1BDT, Atlantic, Mass.; 1BGF, Hartford, Conn.; 1BKA, Glenbrook, Conn.; 1RU, Hartford, Conn.; 1RZ, Ridgefield, Conn.; 1XM, Cambridge, Mass.; 1YK, Worcester, Mass.; 2ARY, Brooklyn, N. Y.; 2AJW, Babylon, L. I.; 2BML, Riverhead, L. I.; 2EH, Riverhead, L. I.; 2FD, New York City; 2FP, Brooklyn, N. Y.; 3DH, Princeton, N. J.; 2ACF, Washington, Pa.; and 8XV, Pittsburg, Pa., with the probability that 4GL, Savannah, Ga., was also heard.

In glancing over the above lists one is struck by the preponderance of the C.W. stations, and by the fact that the British heard C.W. stations only. That can mean only one thing, that C.W. is far superior, and I should like nothing better than to see all amateurs change over to continuous wave at once. Spark methods are horribly out of date, and are so inefficient, comparatively, as to be ridiculous, were it not that many have invested good money in spark equipment. Station 1AFV, since the tests, has gotten three messages across to England (London) on 200 watts of C.W. Many stations of the Atlantic seaboard are reaching to the California coast with similar powers, while the west coast stations have been shoving signals into the Hawaiian Islands. The day is not far distant when amateurs the world over will be exchanging greetings in many languages, and by the same token, the day is almost here when spark stations will be of interest as having to do with history only.

Another Article by Mr. Godley

giving his impressions of radio men and radio methods in England,
will appear in the

April Wireless Age

American Stations Heard by English Amateurs

DURING the recent trans Atlantic amateur tests the following American stations were heard by W. F. Burne, Sale, Cheshire, England, approximately 40 miles from London.

2FP, H. C. Barber, 252 Neptune Avenue, Brooklyn, N. Y.
2BML, R. B. Bourne, P. O. Box 13, Riverhead, Long Island.
2ZL, J. O. Smith, 3 Corona Ave., Valley Stream, Long Island.
1BCG, Minton Cronkhite, Greenwich, Conn.
1UN, Joseph B. Dodge, 26 School Street, Manchester, Massachusetts.
1XM, Massachusetts School of Technology, Cambridge, Mass.
1ZE, I. Vermilya, 24 Allen Street, Marion, Mass.

Reception of the first three stations of the above list included the correct code words as well as the calls.

In the case of 1ZE there were one or two errors in the code word which, however, were easily understandable. 1UN and 1XM were in the "free for all" period.

Mr. Burne has been declared the winner of the first prize offered by several British concerns and organizations for having been successful in hearing the greatest number of American amateur stations. The aerial used by Mr. Burne is an inverted L, supported by one mast on his house and one in an adjoining garden. It is 56 feet high at the house end and 45 feet high at the other. The antenna is within the limited size allowed by the General Post Office, being only 45 feet long. The usual water pipe was used as a ground for the receiving set.

The set used in the record-breaking reception was mostly of home construction. Mr. Burne states that a friend of his classified it as "a glorified collection of junk." SOME JUNK!

The set consisted of the usual tuning devices, radio-frequency transformers and condensers, detector and audio-frequency amplifiers. On the first two nights of the tests four ES 4 valves were used, making a total of five with the separate external heterodyne. On the third night five tubes were used as radio-frequency amplifiers, in addition to the heterodyne. On succeeding nights six radio-frequency valves were used, with the occasional addition of one or two steps of audio-frequency amplifiers.

HEARD BY H. H. WHITFIELD

The following stations were heard by H. H. Whitfield, who was awarded the second prize offered by British concerns.

1AFV, F. C. Estey, Salem, Mass.
1BCG, Greenwich, Conn.
2ZL, Valley Stream, Long Island, N. Y.

In the first and third cases the special code signals were correctly received, as well as the the calls.

As in the case of Mr. Burne's station, the receiving apparatus used by Mr. Whitfield was composed of miscellaneous parts, loosely assembled on a table. The apparatus was all home-made, with the exception of condensers, tubes, batteries and head telephones. Six tubes were used. The aerial of Mr. Whitfield's station is composed of two wires, 40 feet high, running east and west, with the lead-in from the east end. The usual water pipe is used as a ground.

HEARD BY W. E. F. CORSHAM AND R. D. SPENCE

W. E. F. Corsham and R. D. Spence were jointly awarded the third prize, each having heard one American station, as follows:

1AFV, Salem, Mass. Code group correctly received. Heard by Mr. W. E. F. Corsham.
2ZL, Valley Stream, Long Island, N. Y. Code group correctly received. Heard by Mr. R. D. Spence.

(Continued on page 45)

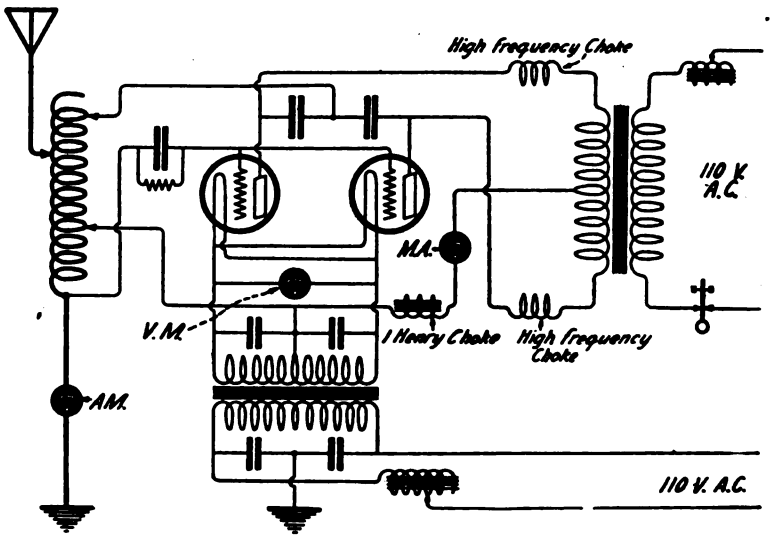
Equipment at 2ZL in Trans-Atlantic Work

THE set used at 2ZL station at Valley Stream, L. I., during the recent trans-Atlantic tests, when signals from the station were heard in England, employed two 250-watt Radiotrons, UV-204, in a self-rectification circuit as shown below.

A transformer, with a split secondary, supplies A.C. for plate potential, at 2,200 volts for each tube, 4,400 over all. The filaments of the tubes are heated with A.C., by means of a transformer, also with split secondary.

The value of the grid leak resistance used in shunt to the grid condenser is 20,000 ohms, and the capacity of the grid condenser .002. The antenna at 2ZL is an inverted L, 85 feet high at the end away from the station, and 65 feet high at the station end. The flat top is 120 feet long. The leads, four in number, are from the low end. The fundamental wavelength of the antenna is 210 meters. The antenna points southwest-northeast, with the leads on the southwest end. In view of the fact that the station was heard in England and at Monterey, Calif., at practically the same time, it seems to indicate that there are no directional effects.

A counterpoise ground system is used, consisting of 8 wires, on spreaders, directly under the antenna, and fanned out at both ends beyond the antenna. The resistance of the entire antenna and ground system is 7 ohms and the antenna current is normally 8 amperes on 325 meters, representing approximately 450 watts in the antenna.



Circuit diagram of 2ZL Station

WORLD WIDE WIRELESS

Hoover Selects Members Of Radio Conference

SECRETARY OF COMMERCE HOOVER announces he had asked the following to be members of the conference to meet for the control and development of radio telephony:

Dr. S. W. Stratton, chairman, director of the Bureau of Standards; representatives, one each, from the War Department, Navy Department, Post Office Department and Department of Agriculture.

Senator Kellogg, Minnesota; Representative White, Jr., Maine; R. B. Howell, Omaha; Dr. A. N. Goldsmith, Secretary of the Institute of Radio Engineers, New York; Prof. O. M. Jansky, Jr., University of Minnesota; Hiram Percy Maxim, President of the American Relay League, New Haven, Conn., and Prof. L. A. Hazeltine of Stevens Institute, Hoboken, N. J.

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American T. & T. Broadcasting Station

A PERMIT has been granted for the erection of a wireless telephone broadcasting station by the American Telephone and Telegraph Company on the roof of the twenty-four-story operating building between Walker and Lispenard streets, New York City. This building is 350 feet high and rises conspicuously above any other building in the immediate neighborhood. The steel towers supporting the antenna will be 100 feet high.

It is expected that the work will be started at once and the station will be ready to begin operations in less than two months' time.

This wireless broadcasting station will be unique in many respects. It is to be equipped with the latest developments of the Bell system, including the use of electrical filters and new methods, whereby as the business grows, several wavelengths can be sent out simultaneously from the same point, so that the receiving stations may listen at will to any one of the several services.

It will be unique in another respect, because it will handle the distribution of news, music or other programs on a commercial basis for such people as contract for this service.

The American Telephone and Telegraph Company will provide no program of its own, but will furnish the channels through which any one with whom it makes a contract can send out their own programs. Just as the company leases its long distance wire facilities for the use of newspapers, banks and other concerns, so it will lease its radio telephone facilities and will not provide the matter which is sent out from this station. There have been many requests for such a service, not only from newspapers and entertainment agencies, but also from department stores and a great variety of business houses who wish to utilize this means of distribution.

The new station on the Walker-Lispenard building is designed to cover a region from 100 to 150 miles surrounding New York City. However, under most favorable conditions, it might be heard for much greater distances, but even for its designed radius it must be permitted to operate on a wavelength free from other radio interference.

Within the area normally covered by this station there are now probably 35,000 receiving stations which would provide an audience for the lessees of the company's radio service. In this same area there are over 11,000,000 people, so that, should such service prove popular, it can reasonably be expected that the number of receiving stations will be greatly increased.

This is a new undertaking in the commercial use of radio telephony, and if there appears a real field for such service, and it can be furnished sufficiently free from interference in the ether from other radio services, it will be followed as circumstances warrant by similar stations erected at important centers throughout the United States.

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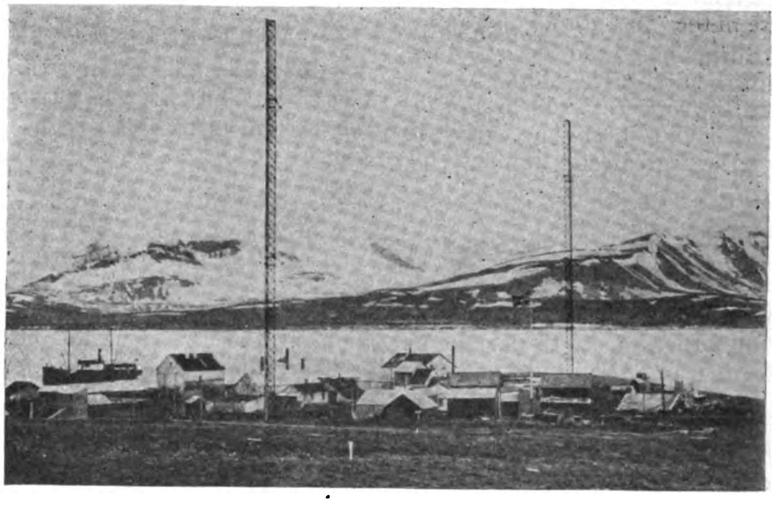
Multiplex Radio Operation Demonstrated

A LONG forward step in the science of radio communication was demonstrated in the Engineering Societies building, New York City, recently, when telephone and telegraph messages were carried simultaneously from a single wireless transmitting set and antenna. They were received also by a single radio set without interference or distortion, and brought down to clear and audible hearing.

The achievement was demonstrated by Dr. Frank B. Jewett, chief engineer of the Western Electric Company, and head of the Bell system research laboratories, and was made possible largely through an electrical "filter" invented by Dr. G. A. Campbell. The device makes it possible to separate the various frequencies at which the individual telephone and telegraph messages are carried.

Two specially constructed demonstration radio sets were placed in the auditorium for the benefit of members of the telephone society, who are chiefly electrical engineers and communication experts. The



Wireless station located at Green Bay in the Arctic regions telephone and telegraph messages were dispatched at the same time and were received at the other end of the stage. They were detected by a single vacuum tube circuit, after which they were passed through the "filter," which separated the frequencies of the telegraph message from those of the telephone message.

"Mush" hearing "his master's voice" by radio at Keith's Royal Theatre, New York

The filter differs materially from the ordinary tuned circuits familiar to the radio engineer, as the filter separates not single frequencies, but bands of frequencies of any predetermined width. The filter makes it possible to separate the band of frequencies comprising the telephone message from the band comprising the telegraph message. It can also separate one telephone message from another.

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Naval Radio Bill Passes Senate

THE House resolution extending privileges of naval radio service to the press for five years has been adopted by the Senate. The bill applies particularly to naval radio between the Pacific Coast and the Orient.

Under an amendment, adopted by motion of Senator Poindexter, Republican, of Washington, in charge of the bill, the press privilege will extend also to radio between the west coast and Alaska and Hawaii.

President Harding urged Senator Poindexter recently to push the bill, which was indorsed at the International Press Congress at Honolulu. It authorizes the Secretary of the Navy to fix reasonable rates for radio transmission of news until June 30, 1927.

The bill now goes to the House for consideration of Senate amendments.

Dutch Papers Get News by Radio

WIRELESS telephonic journalism has been started throughout Holland, bringing good results. Fifty different newspaper subscribers of the Vasdiaz Agency at Amsterdam, equipped with a simple receiving apparatus, receive news throughout the day.

This is considered only the commencement of wireless telephony for journalism in Europe. Although not yet extended abroad, this service will undoubtedly follow. International laws requiring special Government permits for sending and receiving messages abroad are at present the only obstacles.

The Vasdiaz Agency received congratulatory messages from the Dutch Ministers and authorities and also from foreign Government officials, including Premier Lloyd George, who said:

Although over-burdened with work, I wish to express my great interest in the wireless telephone and hope the service will prove a great success in future journalism.

M. Vasdiaz said: Today's results have been most satisfactory. The sending stations worked perfectly.

A well-known Hague editor said: The Hague papers obtained excellent results in transmission by the new wireless telephone. Messages sent out from Amsterdam can be received by the whole of Holland. I consider it a great development in journalism.

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Shippers' Clearing House to Use Radio

AN announcement made by Jonathan Starr, president of the Shippers' Clearing House Company, brings to light a plan to utilize the wireless telegraph for tracing goods lost in transit. Losses now, according to the statement of Mr. Starr, annually cost shippers in the United States $109,000,000 through thieving and careless handling.

The plan comprises the establishment of radio plants throughout the country in thirty-five cities. A system of zones will be laid out which will make communication easy from one end of the United States to the other.

This service is not for transmitting commercial messages, or for public use. We merely contemplate help for shippers, who because of the delays which invariably accompany tracing by mail and telegraph are suffering severe losses in forwarding merchandise, said Mr. Starr.

The plants will be installed in New York, Boston, Hartford, Providence, Waterbury, Portland, Utica, Philadelphia, Harrisburg, New London, Pittsburg, Cleveland, Cincinnati, Toledo, Wilmington, Baltimore, Toronto, Detroit, Indianapolis, Chicago, St. Louis, Memphis, Nashville, Birmingham, Atlanta, New Orleans, Dallas, Omaha, Cheyenne, Salt Lake, San Francisco, Los Angeles, Seattle and Grand Rapids.

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Wireless to Be Compulsory on Aircraft

OWING to the agitation by aeronautical experts for wireless to be fitted to aircraft, the British House of Parliament announces that regulations are to be issued making the carrying of wireless apparatus by British aircraft compulsory as soon as the International Convention on Aerial Navigation has been signed by the majority of the signatory states.

This Convention provides for wireless apparatus being carried by aircraft used in public transport and capable of carrying ten or more persons.

The Air Secretary also stated that all large aeroplanes at present employed on the subsidised cross channel service shall be equipped with wireless.

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German Radio Interests in Italy

ACCORDING to the Agenzia Economica Financiaria, as reported by American Commercial Attache H. C. MacLean, at Rome, the Radiotelegrafica, a company having its offices in Rome, has acquired all of the patent rights of the Telefunken Company (German) for Italy, and has presented to the Italian government a plan for the construction of a high-power radio station.

E. F. W. Alexanderson Returns from Europe

RETURNING from a business trip of several months' duration to European countries, E. F. W. Alexanderson, wireless expert of the General Electric Company and chief consulting engineer of the Radio Corporation of America, brings word of the successful completion of plans for a big international radio central, to be built at Rio de Janeiro, Brazil.

Mr. Alexanderson went abroad to attend an engineering and technical conference comprising radio engineers of America, England, France and Germany, held at London. This conference considered engineering plans for carrying out international projects.

The conference agreed on engineering details regarding the new station in South America. That station, it is stated, will be modeled closely upon the big American radio central on Long Island, the main operating station of the Radio Corporation of America, and noted as the largest of its kind in the world. In addition to the station at Rio de Janeiro, there will be a sub-station at Para. South America already has one radio station at Buenos Aires, Argentina, erected by Germans, but now taken over by the new international company.

Plans for the station at Rio de Janeiro are now going through, but there has been no announcement as to when it will open.

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Radio Reduces Revolution in Mexico

WIRELESS telegraphy has contributed greatly to keeping down revolution in Mexico and the government, recognizing its value, is establishing stations in every large city in the republic.

Officials assert that by using the wireless they are able to communicate directly and immediately with military headquarters, and thus are able to head off many incipient uprisings which might grow into serious revolutions if not promptly checked.

In the old days the first thing a band of rebels did was to cut all telegraph and telephone wires, thus isolating the region of revolt.

In its station at Chapultepec Park here the Mexican government has one of the largest and best equipped plants on the continent. During the Carranza administration the station was practically idle, but during the past few months it has been used daily by the government in sending official news letters to Central and South American countries, and in keeping its ministers and consuls informed of affairs at home.

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Naval Stations on Pacific Coast

ASTORIA, OREGON, the seaport at the mouth of the Columbia River, will become one of the most important links in the radio facilities of the western coast of America, and of the entire Pacific Ocean with the completion of the improvements which the Federal Government has announced and which are already under way in their preliminary stages.

The two naval stations already existing at North Head and on Youngs Bay, short distances from Astoria, are to be enlarged and expanded until they are not only capable of handling the enormous wireless traffic which has grown up with the development of Astoria into a port of first rank on the Pacific Coast, but also of accommodating the radio business of years to come.

The station at North Head, in Washington, at the northern promontory at the mouth of the Columbia, will be furnished with a new power plant under the project which was recently detailed by Commander Milton H. Anderson, communications officer of the thirteenth naval district. New and enlarged apparatus is also to be installed at North Head.

Beside the present stations which are to be enlarged, the government has established two radio compass stations at the mouth of the Columbia to protect the river entrance. This harbor entry is said to be one of the safest in the world, for it has a depth of 43 feet at mean low water over a width of a mile. The radio protection afforded it, however, serves to make it still safer for mariners.

President Harding Has Radiophone Set

PRESIDENT HARDING has a radio phone set, which he uses to get music out of the air. He told about a concert he heard which he thought was in Anacostia, a suburb.

"No, Mr. President," some one ventured, "that concert was in Detroit."

"Well," returned Mr. Harding, "I am surprised. It was so plain I thought it was somewhere in the District of Columbia. I thought the Detroit Symphony Orchestra was playing here."

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English Radio Stations Recommended

THE Wireless Telegraph Commission has recommended to the Government the erection of stations in England, Canada, Australia, South Africa, India, Egypt, East Africa, Singapore and Hong Kong. The Commission spent a year in its study of the question.

The average cost of the stations is estimated at not more than £160,000, but the cost of those in England, Egypt, Singapore and Hong Kong would aggregate about £853,000. The Commission recommends two wavelengths for each transmitting station, and that each centre be equipped for receiving from several stations in the chain simultaneously.

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Radio Improves Mail Service

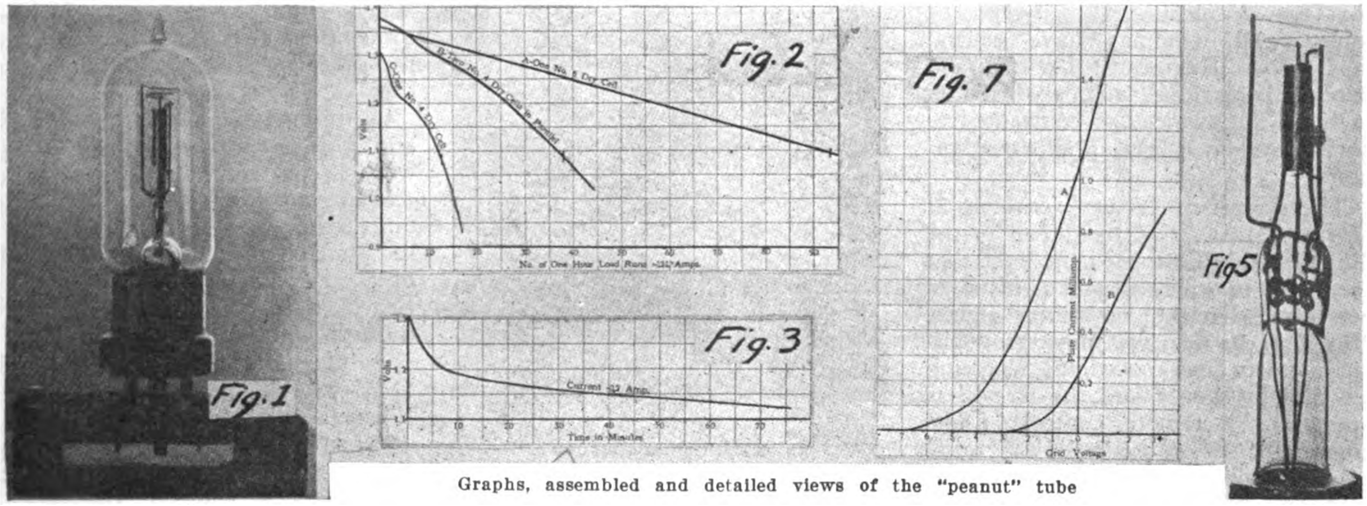
ANOTHER use for radio has been found by the Kreetan Lumber Company of Johnswood, Drummond Island, Mich. The radio is used by the company for dispatching and receiving important mail. Ordinarily it takes several days for mail of the company to go from Johnswood via the Soo to the mainland of Michigan. To obviate this the company uses the radio to Sheboygan and W. W. Kathan, local radio operator, forwards the letters from and directs replies mailed to Sheboygan, and they are repeated by radio service between the two places. Four days' time is saved by this method, it is estimated.

Amateur Station Calls

The Wireless Age for April will contain a list of Amateur Station Calls, in all districts, issued since June 30, 1921.

A "Dry Cell" Vacuum Tube

A NEW tube, which makes the use of a storage battery unnecessary, has recently been developed, according to H. M. Ryder, of the Westinghouse Electric and Manufacturing Co. Figure 1 shows the tube reproduced to about two-thirds actual size. It is somewhat smaller than most tubes and fitted with a base designed to prevent its being accidently placed in a socket supplied by a six-volt battery and thereby having its filament ruined. This base is also designed to prevent the accidental connecting of the plate potential to the filament terminals.



Graphs, assembled and detailed views of the "peanut" tube

The filament requires but 1.1 volt to operate and uses 0.2 ampere continuously. This means a power consumption of less than one-fourth watt as compared with 3 to 5 watts in the ordinary tube filament. For this reason it is possible to operate the filament from a single dry cell and avoid the greater expense and trouble incident to the use of a storage battery. In addition to this advantage, a plate battery of 22 volts is sufficient for all work, except where the utmost in signal strength is required, in which case a plate potential of 30 volts will give slightly better results. A higher potential than this is never necessary and a potential above 22 volts is seldom needed. The tube is hard, so that the plate voltage adjustment is not critical.

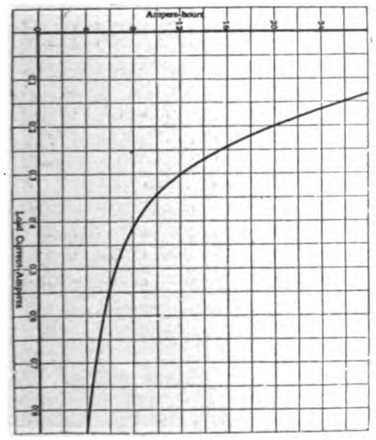


Figure 4—Load characteristics

An idea of how long a dry battery should last in the service required by this tube, is given in figures 2 and 3. In both cases it has been assumed that the tube is to be operated one hour out of each twenty-four. Figure 4 is added to show how the power obtained from a single No. 6 dry cell will vary with the rate at which the dry cell is drawn upon. Thus, if several dry cells in series were used to supply a filament requiring 0.8 ampere, only five ampere-hours would be available from each cell before its voltage would have dropped to one volt at the end of a one-hour run, while 22 ampere-hours would be available for supplying a filament requiring 0.2 amperes before the voltage would take a corresponding drop.

This information illustrates the possibilities of this tube in a portable receiving outfit. It is probable that more such outfits were carried to camp during the summer of 1921 than during any previous season, in spite of the limitations imposed by a storage battery. This "dry cell" tube now makes it practicable for a camping party to carry a receiving set of small dimensions and weight, and of sufficient range to keep in touch with world affairs through the present radiophone broadcasting which has become general.

The advantage is not limited, however, to the portable set. In the home, a dry cell is always to be desired in preference to a storage battery, not only on the score of economy, but also because a dry cell may be located in any convenient place.

It is logical to ask how this great decrease in filament power consumption has been accomplished. The design of every essential element in the tube contributes to this end. Figure 5 shows the interior arrangement and figure 6 the elements which go to make up this structure. The filament is of platinum, about one-eighth as thick as fine tissue paper, and one one-hundredth of an inch wide. This is coated with a very thin layer of certain oxides with the result that a special form of Wehnelt cathode is formed. This filament is welded to end supports for easy assembly, and is kept in position by the aid of a specially constructed and very flexible form of spring. This spring enables the filament to move freely in case of a severe jar, but otherwise to be held firmly in place. It results in an exceedingly rugged structure for so delicate a strip. The grid and plate are of the common forms except that very small and exact dimensions are used. If accuracy and inspection were not carefully maintained, inoperative tubes would result. The assembly is centered about the electric welding

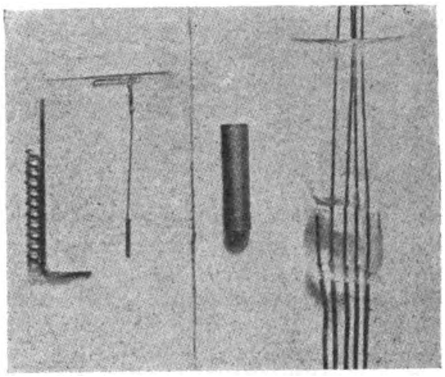


Figure 6—Elements of the "peanut" tube

(Continued on page 40)

Three Well-Known Amateur Stations

THE three amateur stations, 1ZE 8ZG and 9AKR, all equipped with 100-watt Kenotron outfits, have become so well known on the air that a detailed description of them will undoubtedly be of interest.

The transmitting sets used at these three stations are identical. A 750-watt transformer, with 110-volt, 60-cycle primary, has three windings, one providing high voltage, approximately 1,200 volts for the plates of the Kenotron tubes, another supplies 10 volts for heating the filaments of the Kenotrons and the third provides 10 volts for the filaments of the oscillator tubes. All windings have central taps. Two Kenotrons, UV-217 and two oscillators, UV-203, are used in each of the sets. The constant frequency system is used in all three stations.

The station of Irving Vermilya, at Marion, Mass., 1ZE, is shown in the illustrations. Owing to the fact that the shack in which the set is installed gets somewhat cool on winter nights, "Speedo," as Mr. Vermilya is popularly known, has moved the receiving set into his house and the station is operated by remote control. The antenna of the station is of the vertical fan type, of 20 wires, suspended from two poles approximately 90 feet high. A counterpoise ground, also of 20 wires suspended under the antenna, is used.

The C.W. signals of 1ZE station have been reported from Cristobal, Canal Zone, on the Pacific side of the Isthmus, and this station was one of those heard, and the code letters verified, by amateur stations in England during the recent trans-Atlantic amateur tests.

A vertical harp antenna and counterpoise is used at 8ZG station

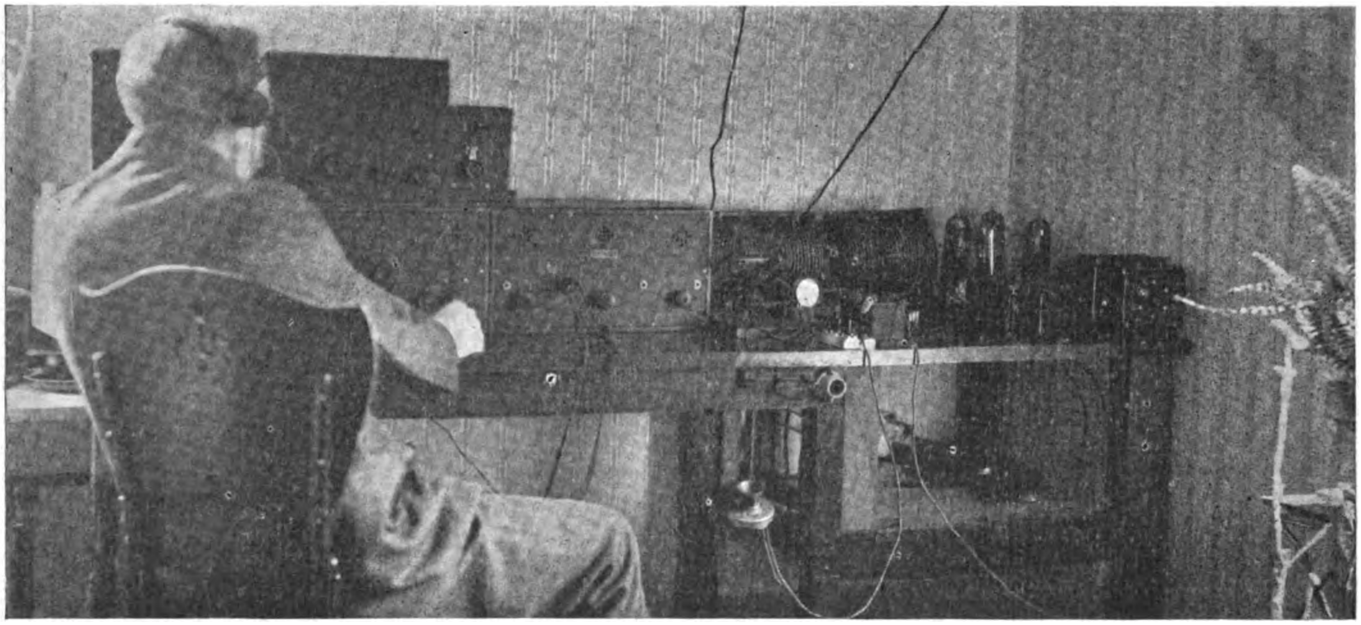
In addition to these extreme and exceptional night distances, the station has carried on regular communication with the Eighth and Ninth districts. The daylight range of the station, with straight C.W., is approximately 150 miles. A magnetic modulator is used for voice communication and distances up to 75 miles are regularly covered during daylight by voice. A separate receiving antenna, consisting of a long, single insulated wire laid on the ground, enables duplex operation with other stations. The normal antenna current of the station is 5.2 amperes on 375 meters.

The station of A. J. Manning, Salem, Ohio, 8ZG, has made many exceptional transmitting records during the winter months. The set was installed on October 19 and on the same night signals from 8ZG were heard in the First, Second and Ninth Districts, and a complete message which was transmitted from 8ZG to 2EL, Freeport, L. I., was copied at Havana, Cuba.

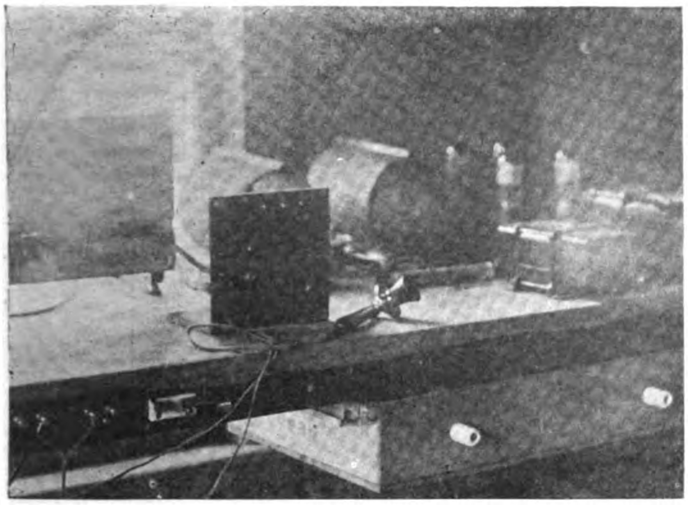
On the night of November 12, 8ZG and 5ZA, at Roswell, New Mexico, were in communication for an hour, exchanging traffic, an overland distance of 1,400 miles. On January 6 the signals of 8ZG were reported as of good audibility by 6ALP, at Long Beach, Calif., an approximate distance of 2,100 miles.

A magnetic modulator is used at 8ZG and a daylight range of 100 miles is regularly covered by voice. The dependable daylight range of the set for telegraphing, using straight C.W., is 200 miles, and the regular night range, 400 miles. The antenna current of the station is normally 4.5 amperes, on 375 meters.

The third station of the group, that of A. C. Mertz, Mount Carroll, Ill., 9AKR, on the northwestern corner of the State, has been heard several times on both coasts. As in the case of 8ZG, this station was reported

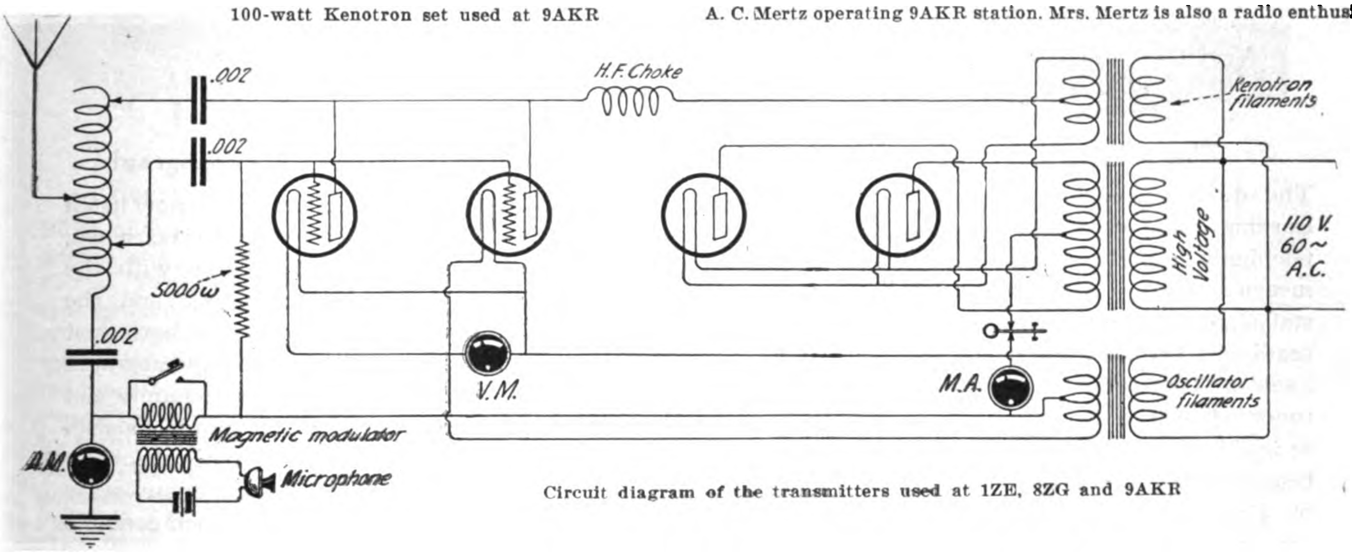


A. J. Manning, Salem, Ohio, operating 8ZG station, which is equipped with a 100-watt Kenotron set

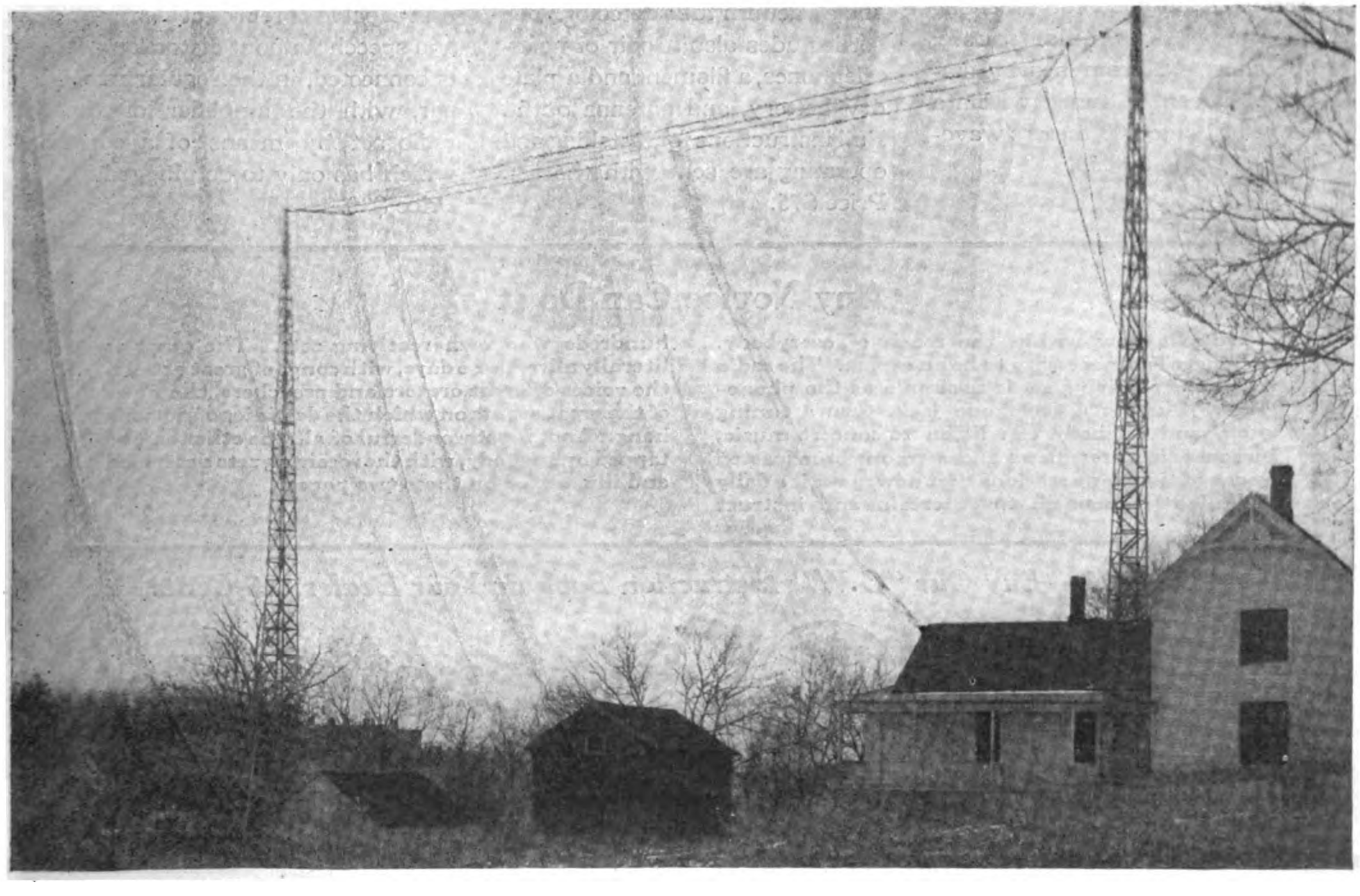


100-watt Kenotron set used at 9AKR

A. C. Mertz operating 9AKR station. Mrs. Mertz is also a radio enthusiast

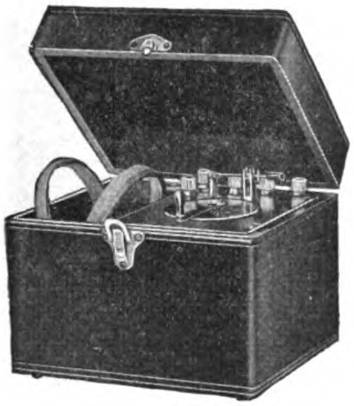


Circuit diagram of the transmitters used at 1ZE, 8ZG and 9AKR



The antenna system installed at 9AKR, Mt. Carroll, Ill., is of the T flat type at an elevation of 100 feet

Every Family Can



The Aeriola Jr.

The quickest, easiest way of learning radio reception — both telephony and telegraphy—is by means of the Aeriola Jr. Once installed, only two adjustments are required. The set is complete in itself and includes a variable tuner, a fixed condenser, a supersensitive crystal detector and head-telephones, and antenna outfit. Full instructions for installing and operating are provided. The Aeriola Jr. is good for receiving broadcasted signals, music, speeches, etc. from nearby stations. It can be tuned within a range of 190 to 500 meters wavelength. Price $32.50.

The Aeriola Sr.

Like the Aeriola Jr. the Aeriola Sr. is designed to meet the requirements of novices and beginners who have no technical knowledge of radio, but who wish to "listen in" and enjoy broadcasted music, sporting news, speeches, etc. It has a longer range than Aeriola Jr. It has features found only in more expensive apparatus, such as the Armstrong regenerative circuit to increase the strength of reception, and a vacuum tube detector. The set includes also a pair of head-telephones, a filament and a plate dry battery, and antenna outfit. Full instructions for installing and operating are sent with the set. Price $75.

As from a Phonograph

The whole family can now listen to broadcasted concerts, news, sermons and lectures with the Vocarola. The music and the words come out of a horn, just as they do from a phonograph. Any member of the family can operate it. The Vocarola consists simply of a horn which is mounted on the wall or any other suitable place and which contains a special, loud-speaking receiver unit capable of reproducing music and speech without distortion. It is connected, in the regular manner, with the amplifier of the radio set by means of a cord, which has only to be plugged in. Price $30.

Any Novice Can Do It

Radio is now within the reach of everybody. No longer is it necessary to be an expert. The radio telephone receiving set is as simple as the phonograph. Plug in a telephone jack, turn a tuning knob, and anybody can listen to concert music, speeches, lectures, news and sermons broadcasted by one of the many stations that now make it a daily and nightly business to entertain and instruct hundreds who own receiving sets. The ether is literally alive, these days, with songs of great artists, the voices of great orators and preachers, the news of the great events on which the destinies of nations hang. And, most wonderful of all, the ether can be tapped by anybody, with the receiving sets described and illustrated on these two pages.

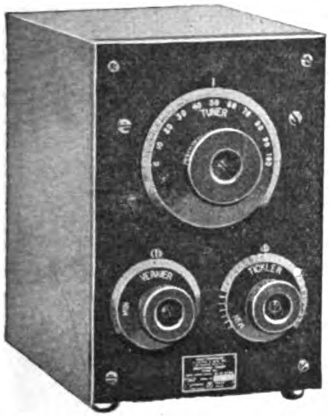
Amateurs — Buy Our "C W" Instruction Book at Your Dealer, 25 Cents

Radio Corporation of America

WORLD WIDE WIRELESS

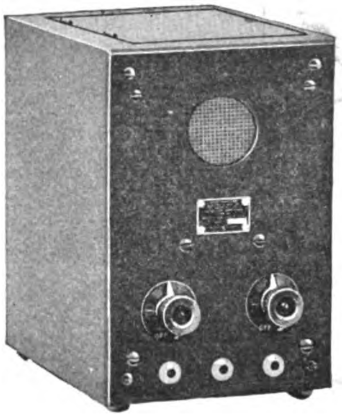
Sales Division, Suite 1801
233 Broadway, New York City

Now "Listen In"



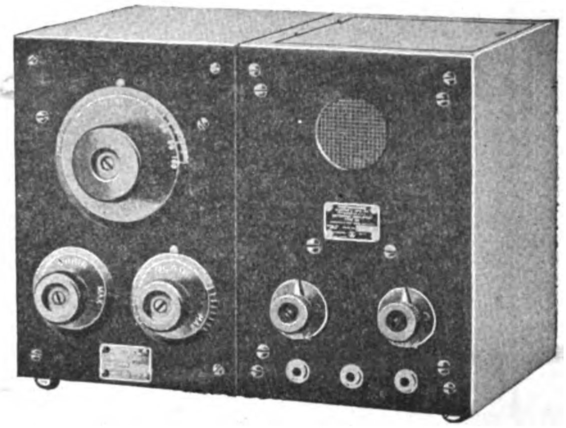
Type RA Short-Wave Regenerative Tuner

Most novices begin with crystal detection and later use vacuum tubes. With this unit they can change from crystals to tubes. Only one adjustment is required to tune in the desired signal. The device responds to any wave length between 180 and 700 meters simply by turning a knob. An adjustable tickler coil permits the use of regenerative amplification with a vacuum tube detector unit (Type DA). This tuner can also be used with Type DB Crystal Detector. Hence the novice can begin with crystal detection and later use tubes and amplifiers with this unit. A fine tuning adjustment is provided by a single-plate condenser for tuning in "CW" stations, or for receiving broadcasted music, news, etc. Price $65.



Type D A Tube Detector and Two-Stage Amplifier

This unit enables the novice to pass from crystal to tube detection easily and naturally. It gives him a vacuum tube detector and two stages of audio frequency amplification. Filaments are controlled by two rheostats, one of which regulates the current to the detector tube and the other the current to the two amplifying tubes. Signals may be received either without amplification, with one stage, or with two stages of amplification merely by inserting a telephone plug in the proper jack. The unit should be used with Radiotrons UV-200 as a detector and UV-201 as amplifiers, although UV-201 may be used throughout. Price (less Radiotron tubes and telephone plug) $68.



Type R C Short-Wave Regenerative Receiver

This receiver combines in one cabinet Type RA Short-Wave Regenerative Tuner and Type DA Detector and Two-Stage Amplifier, described elsewhere on this page. Hence it meets the requirements of the amateur or broadcasting enthusiast who wants a modern, compact, portable, efficient receiver which will enable him to hear distant stations. This is an ideal instrument for use with the loud-speaking Vocarola. Messages may be received with the detector alone or with one or two stage amplification. Used with a load-coil (Type CB) signals can be received on wave lengths up to 1,600 or 2,800 meters, depending on the antenna. Price (less Radiotron tubes) $125. Type CB Load-Coil can be supplied for $5.

There's News and Music in the Air

Some of the sets like the Aeriola Jr. and the Aeriola Sr. are so simple that even one who has no knowledge of electricity whatever can set them up and "listen in" to the messages and music sent by broadcasting stations or by enthusiastic radio amateurs. Other, more sensitive sets, described and illustrated on this page, can be operated after a few hours' experience. By connecting a Vocarola loud-speaker with the more efficient sets shown *the whole family* can "listen in."

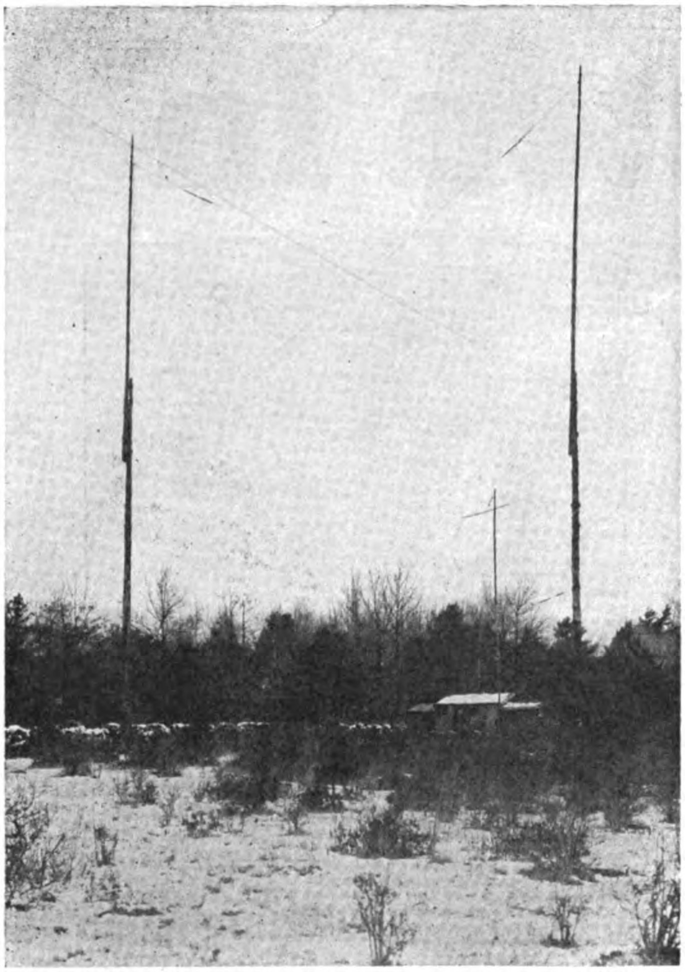
Radio telephone broadcasting now takes its place in the home as a permanent *means of family entertainment and the entertainment costs practically nothing after the apparatus has been installed.*

Dealers—For Quick Turnover Handle the R C A Line

Radio Corporation of America

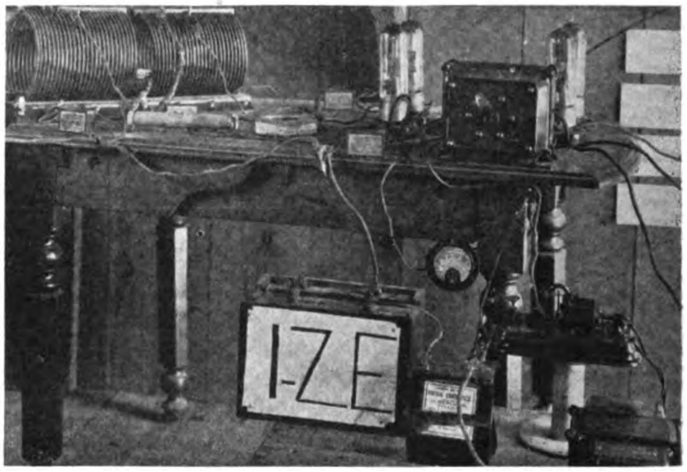
WORLD WIDE WIRELESS

Sales Division, Suite 1801
233 Broadway, New York City



The vertical harp type of antenna installed at 1ZE

Irving Vermilya of Marion, Mass., operating 1ZE



The 100-Watt Kenotron installation at 1ZE

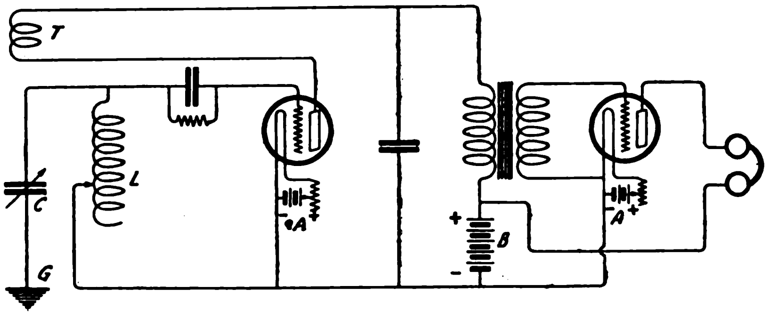
from exceptional distances the first night it was operated, and communication was established with 8AWP, Syracuse, N. Y.; 5ZA, Roswell, New Mexico, and 9AMB, Denver, Colo., through considerable static. During January the signals of 9AKR were reported from several points on the Pacific Coast and also by stations in Massachusetts and Rhode Island. The dependable daylight range of 9AKR is 200 miles, using C.W. for telegraph communication, and voice communication, using a magnetic modulator, is regularly carried on over 100 miles. The normal antenna current of the Station is 4.2 amperes, on 375 meters.

A Radio Receiving Circuit Without Aerial

By Lee Sutherlin

THESE are days when so many things are being done in radio telegraphy and telephony that most of us are inclined to take much of the new development as a matter of course. If we consider all of the minor details of receiving circuits we soon find that there are scores of different ones. The exact circuit to be used in any case usually depends upon the apparatus at hand.

The accompanying diagram shows a circuit which can be made up by using a small amount of relatively simple apparatus, to be used without an aerial. The values of the constants of the circuits are the same as those used in any ordinary short-wave receiver with one stage of audio amplification. It is not necessary to use separate "A" batteries as shown. The tuning is accomplished by varying L in steps and making fine adjustments with C. The ground employed was the water pipe of a local heating system.



Circuit of receiving set without antenna

Using the above circuit, the writer, located just outside of Washington, D. C., was able to hear the concerts sent out by KDKA, the broadcasting station of the Westinghouse Electric and Manufacturing Co., at East Pittsburgh, Pa. KDKA was using 650 watts in the antenna. During the past year while located in Pittsburgh, Pa., I often heard the high power stations of the East Coast and Canada with a single tube and without an aerial.

RADIOPHONE BROADCASTING

The Future of Broadcasting

BROADCASTING by radio telephone is destined to have an effect on social and political life comparable to the invention of printing. Its effect on national artistic development will equal that of the moving pictures. Its possibilities have not yet begun to unfold themselves, and its problems yet to be solved are tremendous.

These are a few of the impressions gleaned from an interview with Dr. Goldsmith, published in the New York Globe. Dr. Goldsmith is professor at the City College of New York, director of the radio telegraphic and telephonic laboratory at that institution, secretary of the Institute of Radio Engineers, director of the research department of the Radio Corporation, and former consulting engineer of the General Electric Company.

"Radio broadcasting," predicts Dr. Goldsmith, "will provide the school, the theatre, the lecture platform of the future. A man will be able to have in his own home, the news, the latest play, the opera, a lecture, or a political debate. He will not be required to accept one of these alternatives at any given time, but will be able to choose any of them, since they will all be sent out concurrently on different wave lengths.

"The result on the political life of the country will be incalculable. The United States is a particularly scattered nation, dependent almost entirely for its unity on the rapidity of its means of communication. The latter at present consists of the press, the periodicals, the wire telegraph, and telephone.

"The two former are by their very nature, deferred in their effect in greater or lesser degree. The two latter are immediate, but personal, reacting generally only between individuals. They reach a definite point; the radiophone covers an area. In radio broadcasting is the means of both immediate personal contact—between the officials of the government and its citizens, between the candidate and his possible constituents. As a result reactions to great issues will be direct, swift, and unaffected by geographical differences. The nation will be integrated to a degree never conceived of, and the resulting effect on our life and institutions is equally inconceivable.

Broadcasting Stations

WJZ—360 meters. Sundays, Tuesdays, Thursdays and Saturdays, 11 A. M. to 10 P. M. Westinghouse Station located at Newark, N. J.

KDKA—360 meters. Daily, 8 to 10 P. M. Westinghouse Station located at East Pittsburgh.

WBZ—360 meters. Sundays, Mondays, Wednesdays and Fridays, 8 P. M. Westinghouse Station located at Springfield, Mass.

KYW—360 meters. Daily, 8 P. M. Central time, 9 P. M. eastern time. Westinghouse Station located at Chicago, Ill.

"The effect on the nation's artistic life will be equally great. As the motion pictures have stimulated people's artistic visual images, so will the "Movies of the Ether" stimulate their aural images. It can reasonably be predicted that popular taste in music and the spoken drama will be immeasurably uplifted."

Dr. Goldsmith also pointed out another analogy between the radio and the movies, in that the former is a projection of a special sort of electro-magnetic or light wave, and the latter of an ordinary light wave.

"However," he continued, "the radio telephone has certain definite provinces. It will not, as some imagine, replace the wire telephone. Upon the latter will always depend the basic communications in congested districts; just as transoceanic communication, and communication affecting moving bodies and across inaccessible spaces must inevitably be the province of the wireless. Between these two extremes is a large field whose disposition between wire and wireless only the future can determine. But each has essential limitations which will prevent it ever crowding out the other.

Professor Goldsmith made it clear that in its own field the radio was as completely practicable as the wire. In the matter of privacy he explained that instruments have been invented, such as the crypto-code machines, which send out messages in code with tremendous speed, and decode them at the receiver. Anyone listening in would find it practically impossible to pick up the message, or if he did so, to decode it in time to be of any use. Furthermore, these machines can alter the code as often and as irregularly as may be desired. In the field of radiotelephony there is being perfected an instrument which sends out the voice so greatly distorted that a "tapper" would hear mere gibberish; the receiver for which the message was intended, however, picks it up and renders it immediately intelligible. Further the method of distortion is continually changing, so that no listening in could be successful for a very long time.

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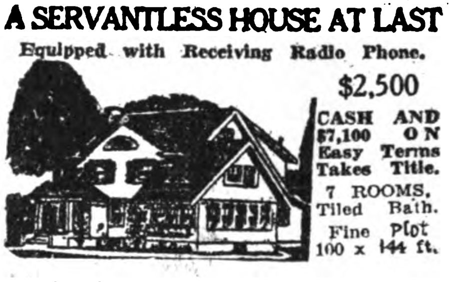
Babe Ruth at WBL

IN greeting his invisible listeners, Babe said:

"I was born in Baltimore and they christened me G. H. Ruth, but whether you know me as George Herman, Babe or Bambino, just let me say that it's a great pleasure to talk to you through the ether. This is an exceedingly pleasant visit to your great city, with its throbbing industries, and I am happy to meet people who have given so much of their wealth to the needy. And by the way—I'm singing this week at the Temple. Come and hear me. There are always plenty of doctors on hand."



A SERVANTLESS HOUSE AT LAST

Equipped with Receiving Radio Phone.

$2,500

CASH AND $7,100 ON Easy Terms Takes Title.

7 ROOMS. Tiled Bath.

Fine Plot 100 x 144 ft.

An advertisement showing the new household status of radio

WDY to Locate in New York

THE Radio Corporation closed down its popular broadcasting station WDY, at Roselle Park, N. J., on Friday, February 17. This move is preparatory to the opening of a station in the heart of New York City.

WJZ, the Westinghouse station at Newark, will broadcast the programmes during the period that WDY is being installed in its new home. WDY and WJZ have been working in conjunction with each other for some time, and no inconvenience will be felt by the far distant enthusiasts by this announcement. When WDY starts to broadcast from New York, WJZ will be silenced.

The new station the Radio Corporation will open in the metropolis will be the last word in radio. Every conceivable appliance which in any way will give a better service to the wireless fan is being installed. In appointment it will far surpass anything now being used for broadcasting. It might be well to mention here that this move is not one of destructive competition but rather one of co-operation. The Radio Corporation is the sole sales agent of the Westinghouse Manufacturing Company for radio parts and equipment, and it is because of this close connection that the above move is being made for the improvement of the service.

Sigmund Kempner, famous boy xylophone artist, at WDY, where he rendered one of the most enjoyable broadcasting programs

"A Perfect Fool" by Radio

NEVER did a theatrical troupe look forward to a performance with greater enthusiasm than did the two dozen members of Ed. Wynn's "A Perfect Fool" company, on the occasion of their appearance at WJZ.

The novelty of the occasion appeared to act like an intoxicant on the company, and critics and theatrical persons who have been in steady contact with the show declare that never was it so well played.

Certain stunts were tried for the effect of the radio audience, such as high notes so beautifully sung by Janet Velie and Guy Robertson, which they do not attempt before their auditors in the George M. Cohan Theatre.

No one of their huge audience enjoyed the occasion more than the actors themselves. Several, including the star, experienced a novel attack of stage fright in the beginning, but later played with an enthusiasm that only gala nights in the theatre are able to arouse. Wynn was in fine fettle, continually interspersing with his familiar lines amusing remarks suited to the particular occasion. Guy Robertson, the debonair young tenor, who made a huge hit with his listeners, on each appearance before the microphone, carefully parted his blond hair with a comb borrowed from True Rice, who put it to similar uses, and the ladies of the cast made vigorous use of the powder puff before picking up their cues. Even to the calling time by the call boy, the situation outside the little studio resembled the backstage of a Broadway theatre.

Those of the audience familiar with the show recognized that it was being given in the same order and exactly the same manner as on the stage of the George M. Cohan Theatre. In fact, nothing was left home save the scenery and the ballet. As to the latter, Mr. Wynn explained that a ballet always wore too few clothes "to be sent safely through the air on a winter's night."

One very pleasing feature of the performance was the work of the orchestra, led by Leon M. Rosebrook. Its playing, both in support of the performance and in its separate numbers, met with high favor.

The close contact established between the players and the audience was time and again illustrated by the the spontaneous applause or laughter which broke out in each home on the "circuit" at a song or sally. When Wynn announced an intermission for the purpose of "feeding the actors" hostesses who were giving a radio party arose to follow suit in supplying refreshments to her guests, for which the latter are deeply grateful to Wynn.

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"Listening in" From Ontario to Cuba

EVEN though the WJZ and WDY combined radio program states that "the program can be heard by any one with suitable radio receiving apparatus within a radius of several hundred miles of New York" the radius is considerably greater than that, as proven by the daily correspondence received by the two broadcasting stations, WDY and WJZ.

The most enthusiastic radio fans reside a thousand or more miles distant from New York. The following letter received from the mining region of northern Ontario is interesting and conveys an idea of the benefits to be derived from the development of radio telephone broadcasting, as well as establishing its economic place in the affairs of the world. The letter, dated January 9, written by M. J. Caveney, 3 G.G., Sandy Falls, Timmins, Ont., and addressed to WJZ follows:

"I am located in the Temagami Forest Reserve, seven miles from the end of rails in northern Ontario. I have no idea of how far I am from Newark, N. J., but the range as shown in the various radio journals of your station is given at 300 miles. Anyway, you come in here swell, just like right in the room with you folks over there,

Tufts College Musical Club at WGI

"ALL dressed up and no one to see" might have been the title of the wireless entertainment given by the Tufts College Musical Club one night at WGI, Medford Hillside, Mass.

Although specifically told not to doll up, as no one could see them, some of the college boys could not conceive of singing to an audience of ten to thirty thousand and not being seen. And so, on the night of the radio performance, they appeared in their "soup and fish" with clean collars and plastered hair parted in the middle. It was a shame, for there was no one to admire their stylish dress suits and clean-cut appearance — no one but the whirring motor generators and a taciturn radio operator.

and your operator is an old friend of ours—we know his voice so well.

"Last week, I took the set back into the bush about twenty miles to a new camp—all mineral rock for miles, gold and silver mines all through this country—and, after scratching around for some soft place for a ground wire I discovered a place where I could drive an iron pipe in between two huge boulders. Got it down about three feet and then threw a wire over a tree.

"Just as I thought—in comes old WJZ, and the miners' wives tore the head-phones apart trying to let all listen in at once.

"I stepped outside the shack for a while, while they were listening to you inside. It was a cold, clear, bright night, stars and moon hanging like jewels from the sky, five feet of snow, 42 below zero, not a sound but the trees snapping in the frost and yet, if everybody only knew it, the air was full of sweet music.

"I remember the time when to be out here was to be out of the world—isolation complete—not a soul to hear or see for months on end, six months of snow and ice, fighting back a frozen death with an axe and wood stove in a seemingly never ending battle.

"But the long nights are long no longer—KDKA and WJZ are right here in the shack shortly after sundown, and you come in so plain that the dog used to bark at you, even though I had the head-phones clamped tight on my head. He does not bark any more—he knows you the same as I do—just pricks up his ears at first, then sits blinking at the bulls and listens.

"Long life and prosperity, WJZ."

Another extreme point that has been reported comes from Tuinucu, Cuba. The letter to WJZ was written by Frank H. Jones, electrical engineer of the Tuinucu Sugar Company.

"After listening to your fine program last night I must write to you to congratulate you. Have been enjoying your broadcasted news and music, etc., since November 18 nearly every night.

"The music came in very clear and loud last evening and I had about twenty guests in my house, and there were people out in the street, sixty feet from the loud speaker listening to the music.

"Inasmuch as in your final talk you asked distant receivers to report to you, I though you would be especially interested, as Tuinucu is in the center of the Island of Cuba, about 1,450 miles from Newark. I set my watch regularly with your relay of Arlington time signals."

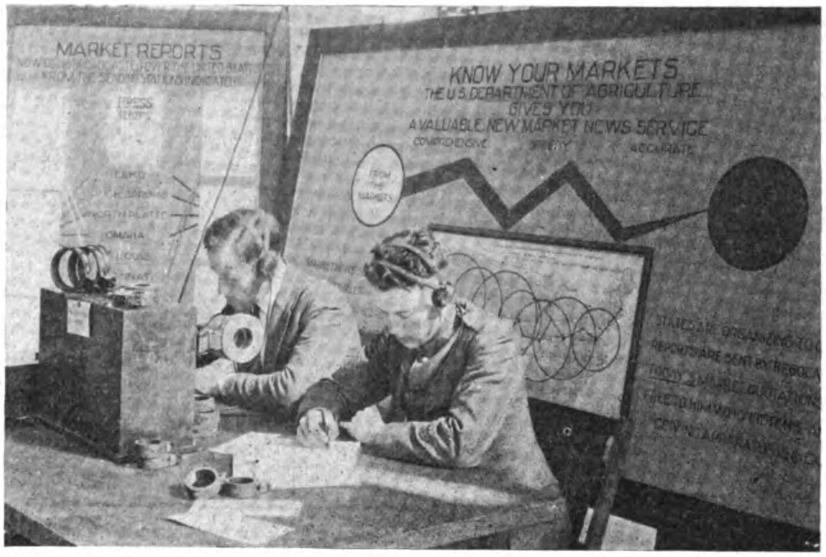
Broadcasting Market News

By S. R. Winters

PROBABLY 4,000,000 persons in eight States — Missouri, Wisconsin, Kansas, West Virginia, Tennessee, Georgia, Illinois and Arkansas—have seen actual demonstrations of equipment and methods employed by the Bureau of Markets, United States Department of Agriculture, in distributing market reports by radio-telegraphy and radio-telephony. The Government receiving apparatus, supplemented by graphic panels illustrating the value and extent of the market-news service by wireless, formed a striking section of the exhibits of the Department of Agriculture, displayed at the fairs in the States mentioned.

The diversity of Government exhibits was considerably augmented by this novel exhibition. Literally, reports of price fluctuations in the food markets were taken from out of space and posted on a bulletin board to demonstrate the effectiveness of a nationwide service of disseminating information "from the markets to the producer." Or, to again employ the words of one of the exhibition panels, "A Valuable New Market News Service —Comprehensive, Speedy, Accurate."

Two wirelesss receiving sets and an equal number of trained operators were required to cover the territory mentioned in the three-months swing around the Government fair circuit. A 110-foot four-strand aerial, was transported from place to place as the schedule of the exhibits might indicate. Three panels formed an integral part of the exhibition equipment. The larger panel of the group was devoted to advertising the service and the benefits to be derived from the service. The second panel described the extent of the Market News Service, thus "Market Reports Now Being Broadcasted over the United States from the Sending Stations Indicated." These sending stations were: Elko, Rock Springs, North Platte, Omaha, St. Louis, Cincinnati and Washington. The third panel in the series displayed was used for posting the market reports as received at the various fairs at specific hours. The photograph, presented herewith, was made at The Southeastern Fair, Atlanta, Ga., when reports of the conditions of the markets were being received from Cincinnati.


MARKET REPORTS
KNOW YOUR MARKETS
THE U.S. DEPARTMENT OF AGRICULTURE
GIVES YOU
A VALUABLE NEW MARKET NEWS SERVICE
OMAHA

Radio market reports exhibit at State fairs

The innovation of distributing market news by radio-telegraph and radio-telephone, wherever actual demonstrations were given, was received with cordial support and the consensus of opinion was that the service should not only be continued but expanded.

Universities in the various States are co-operating with the Department of Agriculture, in popularizing and enlarging the usefulness of the service of market news by radio. Educational institutions in Wisconsin, Ohio and Minnesota are already broadcasting the Department's market reports to the agricultural areas. Kansas, Missouri, Nebraska and Indiana are contemplating a like procedure.

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Actors Install Receiving Set

THE first radio telephone to be installed back stage in a New York theatre was set up and placed in operation recently at the Music Box. The instrument is owned jointly by the members of the "Music Box Revue" cast, and was purchased by them so that they may be able to "listen in" to other entertainments during their stage waits.

EXPERIMENTERS' WORLD

Views of readers on subjects and specific problems they would like to have discussed in this department will be appreciated by the Editor

Filament and Plate Current Direct From A.C. Supply

By Joseph Graff

FIRST PRIZE $10.00

HERE is a detailed description of apparatus which I used for three months to replace both "A" and "B" batteries in the operation of two Radiotron UV-200 tubes acting as detector and audi-frequency amplifier, respectively. The sketches give the general construction of the device.

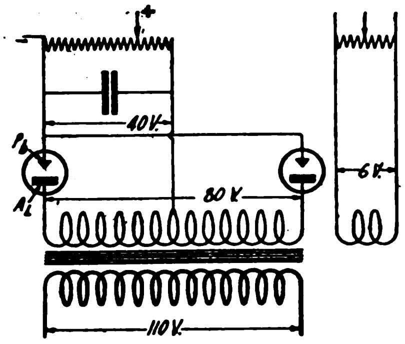


Fig. 1

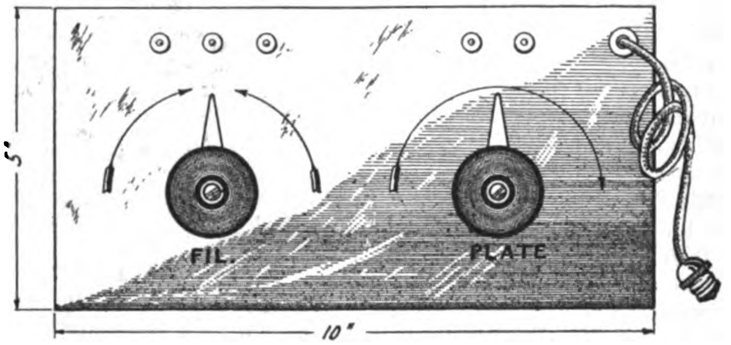


Fig. 4

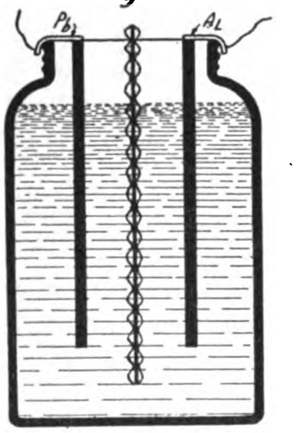


Fig. 3

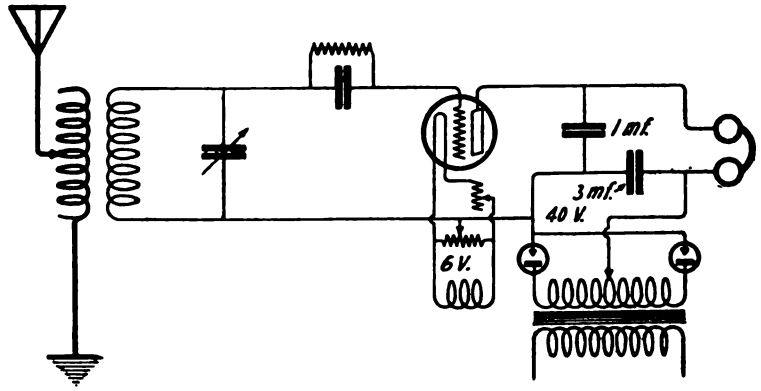


Fig. 2

Transformers, electrolytic rectifiers, hook-up and assembly of current supply device

I never had a storage battery and the dry cells that I used were not going to last more than twenty-five or thirty hours, so I had to set about and get some means of maintaining my precious tubes.

I read several articles in THE WIRELESS AGE regarding the application of A.C. to the filaments of power tubes, and decided that this was to be my only hope. At first I experimented with rectified current for the filaments, but had trouble with the electrolytic rectifiers, and also experienced a sixty-cycle hum in the phones, so I gave up this method. Straight A.C., using a center tap on the transformer, gave a hum in the phones that could be heard QSA in any part of the room, but by using a potentiometer as illustrated in figure 1, I was able to eliminate every slightest trace of the sixty cycles.

As shown in the circuit, figure 1, a step-down transformer is used which delivers two voltages, six and forty, for the filament and plate, respectively. The plate coil is doubled, so that both halves of each cycle may be used. The electrolytic rectifiers work excellently on this potential. The filter condenser is of three microfarads capacity and effectively removes the ripple. A potentiometer of four thousand ohms resistance is shunted across the D.C. terminals, which gives the necessary adjustment for the Radiotron.

The specifications for the transformer used are as follows: Core: 4 inches by 5 inches by 1 inch made up of laminations of silicon steel, single coat of shellac. Primary: 440 turns of No. 22 D.C.C. wire wound on two long legs of core 220 turns to the leg.

Secondary (high voltage): 320 turns of No. 3. D.C.C. wire, wound over primary 160 turns per leg; tap taken between windings at 160 turns. Secondary (6 volts): 24 turns of No. 18 D.C.C. wire wound on two short legs of core. Shellacked paper was used for insulation throughout, between core and primary, between primary and secondary, between 5-

volt secondary and core and over secondaries.

The electrolytic rectifiers are made of 100 cubic centimeter jars filled with a saturated solution of borax. A strip of tin and aluminum are suspended in each one by bending the upper end over the edge of the jar as shown in figure 3. Perforated corrugated cardboard, impregnated in paraffine, may be used to separate the strips.

I have this whole unit mounted in a cabinet 10 by 5 by 5 inches, and the two potentiometers and the required binding posts brought out on the front panel. For the sake of convenience and safety I used a cord and plug which screws into the light socket. A front view is given in figure 4. In conclusion may I say that this cost me less than two dollars.

The Case Against the Storage Battery

By Jack Greenfield

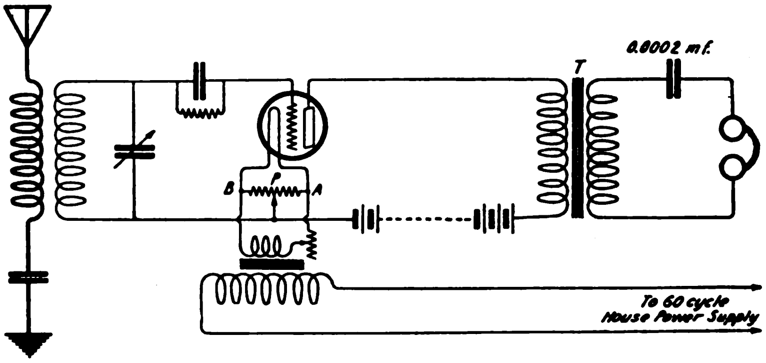
SECOND PRIZE $5.00

I HAVE been wondering for a long time why the storage battery as used for receiving tube filaments was not brought before the amateur's bar of justice and condemned. It is therefore gratifying to see The Wireless Age take the initiative in the matter and put the question up to us to decide. I firmly believe that the storage battery in its specific use as a source of current for receiving tubes has outlived its usefulness.

The initial cost of the battery is high as every amateur knows. But worst of all the initial cost has nothing at all on the upkeep and inconveniences attached to its use. Charging takes time and if you have only one battery you have to close shop until it is charged. In the next place charging batteries is an expensive proposition. Most of us have A. C. power in our homes and therefore cannot charge our batteries unless we have a Tungar Rectifier outfit. As a result we have to lug our batteries to a central station for charging and pay for charging the battery. Then again, if you take care of the batteries yourself there's the sweet job of keeping tabs on the specific gravity of the electrolyte and changing it every now and then — while you burn holes in your clothes with the acid.

These facts condemn the storage battery for use on receiver tube filaments. The use of A.C. on receiver bulbs has also been condemned by some because of the 60-cycle hum being repeated in the phones. However, if the proper type of circuit is employed A.C. can be used with excellent results.

The circuit described elsewhere by H. Brown and as used by the writer is shown in figure 1. The filament is supplied by A. C. 60 cycles stepped down by a transformer to give about 6 volts. The transformer can easily be made, or better still, an ordinary bell-ringing transformer can be used for the purpose. A series resistance consisting of the ordinary filament rheostat is used to vary the filament current. Across the low tension side of the bell-ringing transformer is placed a potentiometer P of about 1,000 ohms, the center point of which is connected to the grid. Unless this connection is made to the grid from the center point the hum will not be eliminated, because if the grid is connected to either end of the filament, it will have large 60-cycle voltage variations impressed on it. Thus suppose it is connected to point A of the filament, or point B. The potential at these points is either plus 4 volts or minus 4 volts, since the A.C. voltage is of that value. When the voltage wave has passed through one complete cycle the potential at either of the points has changed from plus 4 volts to minus 4 volts, or has changed from minus 4 volts to plus 4 volts. This change is so great that the 60-cycle hum must of necessity be impressed on the grid and repeated in the plate. It is therefore necessary to find a point on the filament which is neutral with respect to these voltages, and to connect the grid to it. By connecting a potentiometer as shown this is accomplished. For since one end of the potentiometer is at plus 4 volts and the other at minus 4 volts, at some point in the potentiometer the voltage changes sign, and this point is the neutral or zero voltage point. This will, of course, be in the center of the potentiometer and can be located by varying the potentiometer until the hum is reduced to a minimum.



Hook-up of filament current transformer

This connection alone will give very good results. However, by utilizing one other modification, the very best results can be obtained. This modification is shown in the plate circuit of figure 1. A transformer T is connected in series with the plate battery, the high voltage winding being connected to the plate. The low voltage winding is connected to the head phones in series with a condenser of capacity .002 mf. The transformer should be such that its transformation ratio applied to the headphones will give most efficient results. That is, the impedance of the plate circuit must be equal to the plate resistance of the tube. Suppose the tube has a resistance of 10,000 ohms, and that a pair of 2,000 ohm phones are used. If the transformer ratio is 2 to 1 the phones inserted in the plate circuit through the transformer will have a resistance of 2 square times 2,000, or 8,000 ohms. Thus the right transformer would have a ratio approximately a little higher to make the resistance 10,000 ohms. The ratio would be about 2.5. The action of the transformer condenser circuit in reducing the 60-cycle hum follows: The circuit rejects the 60-cycle hum on account of the impedance offered to it by the small condenser in series with the phones. The impedance of a condenser is inversely proportional to the frequency, consequently the above condenser will show a greater impedance to the 60-cycle hum than to the 500-cycle note. The impedance will be 8 times as great. Consequently the 60 cycles will be swamped by the 500 cycles of the received signal, should any 60 cycles get through.

Thus we have the 60 cycles practically eliminated by the use of the filament transformer and potentiometer. The small remaining 60-cycle hum is effectively eliminated by the plate filter circuit above described. This circuit, it will be seen, does away with the storage battery, and substitutes A.C. power supply where it is available. The cost of the apparatus required is negligible compared to that of the storage battery and its upkeep.

Eliminating the Storage Battery on Receiving Tubes

By Louis Frank

THIRD PRIZE $3.00

BECAUSE of a number of disadvantages which the use of the storage battery presents, most amateurs would be glad to use other means of lighting their receiving tubes, and thus dispense with the storage battery if they only knew how. I want to describe a circuit which does away with the battery and which I have found quite successful.

When I started to look into the question of using the house power supply for the receiving tube filaments, the power which I found available was 110 volts D.C. The main problem in using the 110-volt line is that of eliminating the commutator ripple.

To make the 110 volts applicable to the filament of receiving tubes, which take approximately one ampere of current at about 5 volts, it was first necessary to cut down the 110 volts to the required value. This was done as shown in figure 1 by the use of two resistances, one large and one small. R1 is a resistance of 100 ohms, and R2 is a rheostat of approximately 15 ohms. This range of resistance values is sufficient to reduce the voltage across the filament to proper magnitude, and still allows sufficient leeway to permit of adjustment and variation by means of the rheostat R2.

Various filter circuits were tried to cut out the commutator ripple, and a very simple one was found to give as good results as the most complex. The filter circuit consists essentially of one condenser of capacity ½ to 1 microfarad, and one iron core choke coil, with an inductance of approximately 50 millihenries. The condenser is placed directly across the 110-volt mains, as in figure 2, and the iron core choke coil is placed in the positive lead of the line. Placing it in the negative lead will not yield as good results. The condenser used was a paraffined paper condenser of the Western Electric telephone type, but any condenser of the correct values will do. The iron core choke was roughly put together, by winding about 100 turns on an iron core about three square inches in cross section.

One further adjustment was found necessary. A high resistance of 150 ohms was formed in the manner of a potentiometer and placed across the filament terminals. The grid connection was then made to the movable contact of the potentiometer and, with the set operating, trials were made with the contact of the potentiometer moving from one end to the other. The poorest results were obtained when the moving contact was at either end of the potentiometer, and the best results showing the least amount of commutator ripple, was obtained with the moving contact somewhere near the center. The best position was obtained by trial, of course, and this position fixed by a mark on the potentiometer. Using the above filter circuit and potentiometer arrangement good receiving can be done. The expense of this circuit will be seen to be very low.

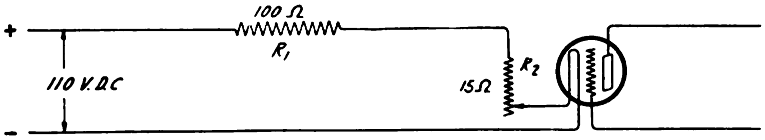


Figure 1—Hook-up of the resistances having different values

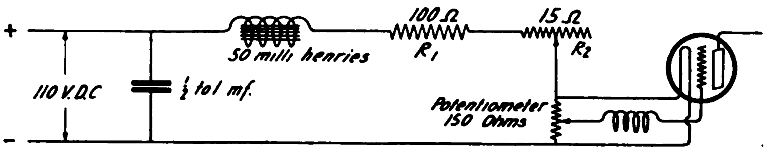


Figure 2—The filter circuit

A "Dry Cell" Vacuum Tube

(Continued from page 29)

machine, and this operation has been refined to a very high degree to make possible such products as are represented in this tube. The final operation in obtaining this tube is performed by the exhaust system. Here special apparatus and special schedules have been developed to make possible a tube of high quality and uniformity.

A characteristic curve for this tube, figure 7, shows that the unusual filament and plate structure and dimensions have in no way produced undesirable variations in this curve. The amplification factor is approximately seven and a plate impedance of about 22,000 ohms is obtained, making it possible to insert this tube in any of the usual circuits designed for a low impedance tube, without fear of unsatisfactory operation.

In operation, the low voltage and power requirements of this tube make certain precautions necessary to the uninitiated user. The filament operates at a low red heat instead of at the bright point to which users of tungsten filament tubes are accustomed. If a six-volt battery were to supply power to this filament with only the usual six ohm rheostat in series, the filament would have a very short life, since the rheostat would not have sufficient resistance to cut down the current to the proper value. At a bright yellow heat this filament will deteriorate rapidly, even though the inexperienced eye may consider it to be operating at a conservative temperature. It is necessary, therefore, until the operator is well acquainted with this tube, that he take special precautions to maintain the filament current at the lowest value, which will give full signal strength. The filament will give no warning, such as a bright light, or noise in the phones, when it is being operated beyond its proper temperature, so that the responsibility for a long filament life lies with the operator in making the proper rheostat adjustments, unless a ballast lamp is used. If this simple rule is followed, the user of this tube will find that he has a new device which will not only make good radio operation more economical, but will enable him to enjoy it with much less attention to the accessories, and in places where he had not thought it possible to carry a set.

Arc Versus Alternator

IN a recent issue of Le Genie Civil an article by A. Bidault des Chaumes discusses the equipment proposed for the high-power station to be erected near Paris.

In the course of the article the author discusses the relative merits of arcs and high-frequency alternators for high-power stations, and in connection with the decision to install high-frequency alternators at the new station, he says:

It now seems certain that the arc systems which have rendered incontestable service in the past will gradually disappear from future installations on account of their numerous inconveniences. This assertion is justified by the following remarks:

In the first place the oscillations set up by the arc are more or less irregular and the useful wave is accompanied by many harmonics which cause interference at receiving stations within a considerable area round the transmitter. Thus the emission from the arc station at the Eiffel Tower possesses many harmonics corresponding to short waves of the order of 300, 600, 1200 meters, etc., in addition to the fundamental wave of 7000 to 10,000 meters wavelength. These harmonics, which are constantly varying, interfere considerably with reception at stations which are accidentally tuned to one or other of these frequencies, even when the receiving stations are as much as 200 km. from the Eiffel Tower.

The arc station at Salonica may also be quoted as a further example. This station uses a normal wavelength of 6,300 meters and a harmonic of 900 meters can be heard at distances of 100 or more kilometers, while it is even detectable at Crete 300 km. from the transmitting station.

The usual process of signaling with arc transmitters consists in slightly varying the wavelength of the oscillations to the extent of from 2 to 3 per cent. in the intervals between the signals. A transmitting station thus radiates two waves with the same power and this fact is particularly harmful at the present time when we are trying to reduce the troubles of receiving stations arising from unwanted transmissions and the multiplicity of communications now necessary.* This question will be brought up at the next International Conference and it is practically certain that the suppression of the harmful spacing wave will be rendered obligatory. This suppression, relatively easy in the case of small and medium-power stations, presents considerable difficulty when the power exceeds about 50 kw., while it becomes still more difficult as the power is further increased. In practice no high-power arc at present operates with such a system and the station at Croix d'Hins, which is the most recent high-power arc station uses the compensation wave for signaling.

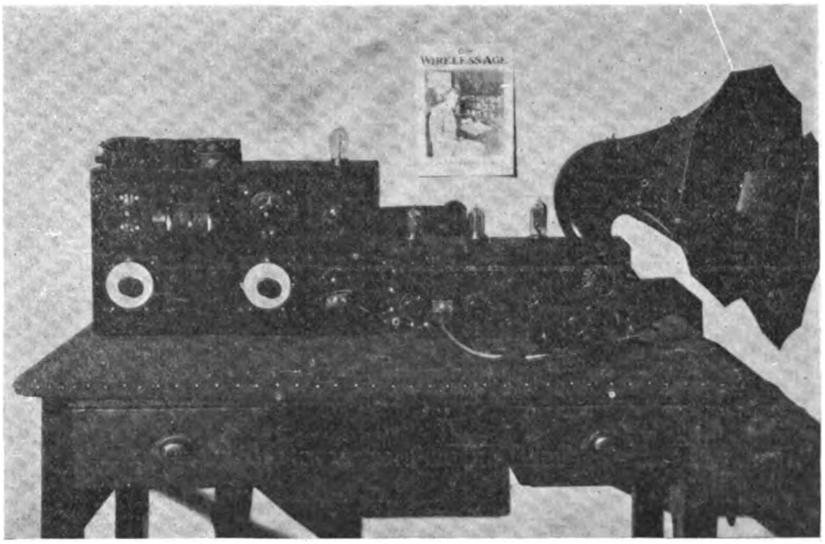
The decomposition of the hydrocarbon atmosphere round the arc which is indispensable to its operation gives rise to sooty deposits in the interior of the arc chamber, the removal of which necessitates frequent and long cleaning operations, so that it is essential to install at least two arc converters in a normal installation, one being in service while the other is being cleaned. If the service is to be a continuous one a third arc is also necessary as a spare. Thus the power installed in the station is for a commercial service three times that which can be utilized at any time, while further a skilled staff is necessary to carry out the cleaning operations and the replacements of the cathodes, etc.

The irregularities in the arc oscillations give rise to excess voltages which endanger the life of the insulators, while when the compensation wave is used for signaling the insulators are practically always under electrical stress.

The preceding remarks are of a general nature and applicable to all arc stations, but the following refer principally to commercial equipments. Firstly, like the valve transmitter, the efficiency of the arc is low, the maximum theoretically possible being 50 per cent. In practice, the efficiency hardly exceeds 40 per cent. when the arc is carefully adjusted, while if this is not done it falls still lower.

The true overall efficiency is also influenced by the fact that the energy is radiated during the spacing periods, while even if a non-radiating artificial aerial is used for the spacing wave the same energy is still wasted as heat in that circuit.

For the successful handling of commercial traffic high-speed methods of signaling are necessary. The methods of keying usually employed with arc transmitters seriously limit the transmission speed since large and irregular currents must be interrupted. When the power of the installation is greater than about 50 kw. complicated arrangements become necessary involving a multiplication of the number of places where the circuit is broken. Such arrangements prevent the attainment of speeds approaching 100 words per minute such as are possible with other systems. As a matter of fact the large arcs working with America do not transmit at a greater speed than sixty words per minute and even this is not attained without detriment to the quality of the emission. The automatically transmitted signals from the Naval station at Annapolis for example are irregular and often unreadable, while on the other hand those received at the same time from the Radio Corporation's stations at Marion and at New Brunswick, which use high-frequency machines (on less power than used in the arcs at Annapolis), are always clear and regular.—The Radio Review.



The home made receiving set belonging to George Kingsley, Maquoketa, Iowa, consists of honey comb coil tuner, vernier condensers. Radiotron detector tube, three-stage amplifier, Baldwin phones and loud speaker. With this receiver, radiophone concerts, lectures, market reports and church sermons are heard. A list of some of the phone stations heard nearly every night are: Reynolds Radio at Denver, Colo., Radio Corporation, at Roselle Park, N. J., Westinghouse Electric Co., at Pittsburgh, Chicago and Newark, N. J., Oklohoma Radio Shop, Oklahoma City, Western Electric Co., N. Y., Anacostia D. C., and 5ZA, New Mexico.

The Monthly Service Bulletin of the

NATIONAL AMATEUR WIRELESS ASSOCIATION

Guglielmo Marconi, *President*
J. Andrew White, *Acting President*
H. L. Welker, *Secretary*

Founded to promote the best interest of radio communication among wireless amateurs in America

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HEADQUARTERS: 326 BROADWAY, NEW YORK

FOR the first time the French Government has decided to grant transmitting licenses to French radio amateurs for experimental transmission purposes.

The wave length authorized for these amateur stations is the same as allowed United States amateurs—200 meters. The power is limited to 100 watts in the antenna. Either spark or C. W. transmitters may be used.

Although the French authorities have been slow in giving sanction to amateurs to transmit, they have been liberal, as compared to English regulations, for instance, in the matter of power and wave length, British amateur stations being limited to 180 meters and 10 watts input.

It is reported that the English amateurs are somewhat apprehensive that their French neighbors may now be the first to accomplish Trans-Atlantic transmission from that side.

* * *

KENNETH R. HINMAN, 13, Plainfield, N. J., has invented a wireless receiver that is no bigger than a safety-match box, exclusive of the headphones. With this match-box wireless he can receive from a radius of 30 miles.

* * *

AMATEUR radio operators and boy scouts of Rutherford, N. J., have sent out an alarm for Eddie Wase. His mother is on the verge of a nervous breakdown.

The missing boy left home February 2. Failure in his high school examinations embarrassed him. He is five feet, ten inches tall and looks older because of being well developed.

* * *

AT the annual meeting of the Peekskill, N. Y., Radio Club the following officers were elected for the coming year: Charles R. Doty, president; George I. Olson, vice-president; Charles MacW. Moore, secretary-treasurer.

The club has taken over the hall on the top of the old post office building, formerly occupied by the Beaver Lodge, as their club rooms. They will take possession this week. Plans are under way for the installation of a wireless set to be used in the club rooms.

Considering the fact that the club did not solicit for members until October, the officers expressed great pleasure at the progress of the club which consists of thirty-two members. Anyone interested in the Peekskill Radio Club is asked to communicate with Secretary C. W. Moore, 934 Liberty street.

* * *

DURING January the signals of 5UU were worked five nights in succession by 2BAK. 2BAK's New Year's Eve concert was heard by 1BMV, 3BVD, 8YAC and 9XX. 9XX states that he had ten sets of receivers in series and that every word was understood on detector and one step, using honeycombs.

* * *

KORBER wireless station at the University of New Mexico, Albuquerque, N. Mex., is now in commission and communication has been established with several radio stations, the one farthest away being at the agricultural college at Las Cruces. The station operates on a 375 meter wavelength. The government call is 5YG.

* * *

THE development and present status of long-distance radio communication and problems pertaining to it were discussed at Franklin Institute, Philadelphia, on February 2, by L. W. Austin, Ph.D., head of the United States Naval Radio Research Laboratory, Bureau of Standards, in Washington.

Dr. Austin presented facts regarding the principal high-power stations of the world, and told of contemplated plans to extend communication by radio.

* * *

WILLARD TAYLOR has been elected president of the Syracuse Amateur Radio Association, to succeed Robert Moore.

P. H. Winchester and William O'Brien were elected vice-president. Andrew Potter, secretary, and Richard Hallenback, corresponding secretary, were re-elected.

The association discussed the advisability of a more general use of the continuous wave radio sets. A committee is arranging for the second annual banquet in March.

* * *

THE Arlington Radio Club, Arlington, Mass., has been granted a station license, 1COD, and is operating a telephone transmitter.

* * *

THE Chelsea Radio Association, an amateur organization, holds its regular weekly meetings at the Hudson Guild Club, No. 436 West 27th street, New York City, every Thursday evening at 8 o'clock. An invitation is extended to all radio enthusiasts to attend these meetings.

* * *

PROF. F. P. DURAND, of the High School of Commerce, Omaha, Neb., addressed the Fontenelle Radio Association on the night of January 24, on "The Development of Radio Transmitters."

* * *

THE Radio Club of Long Island has resolved to reduce interference by violators of the law regulating wavelengths.

The club, whose headquarters are in the laboratory of the Ship Owners' Radio Service, 80 Washington street, New York, begins the activities of the new year with a membership of over forty amateurs. A cordial invitation is extended to all radio men on the northern half of Long Island to join. The club meets every other Tuesday.

As an affiliated member of the Executive Radio Council, the club is planning to put into effect in its district, rules laid down by that body for the betterment of operating conditions. For the further education of its members, it is planned to have a lecturer at each of the meetings.

The club's officers are J. Bruce Ferguson, formerly of Woodside, honorary president; R. H. Fowler, of Flushing, president; Samuel Christie, of College Point, vice-president; William Eckert, of East Elmhurst, Secretary; Edward Fenn, of Manhattan, treasurer; Donald W. Exner, of Bayside, publicity manager, and Lester Browne, of Elmhurst, traffic manager.

* * *

DR. A. F. BANKS, an amateur of San Diego, Calif., is believed to hold a long distance record for low-power wireless transmission, according to a letter from Clifford J. Dow, operator at Wailuki, Maui, 2300 nautical miles from San Diego.

According to Dow's letter, messages sent from Dr. Bank's station on the evenings of December 19 and 20, 1920, were received by him without difficulty, the signals being clearly audible at the island station.

The set is a continuous wave transmitter, using three five-watt vacuum tubes, and an antenna which was only 15 feet above the ground. The transmission wavelength is 200 meters. While many amateurs have sent messages over equal or greater distances than that recorded here, the limited power used by Dr. Banks, undoubtedly establishes a new record.

* * *

THE Hudson City Radio Club, 37-39 Sherman avenue, Jersey City, held its regular meeting on February 7. Mr. May was selected to give the junior members of the club some code practice and Walter Waeger to instruct the class in the theoretical points of radio. Classes for senior and junior members take place at 8 P. M. every Monday, Wednesday and Friday evening. Mr. Wenzel has obtained tickets for the annual convention of the second radio district, which the members expect to attend in a body.

The Hudson City Radio Club was organized last April and was incorporated in August. The official call of the club is 2CBK. The club has a membership of thirty-six. The only requirement for admission is that the applicant must have some sort of a radio set. For information, address all correspondence to the Hudson City Radio Club, Inc., 37-39 Sherman avenue, Jersey City, N. J.

* * *

WIRELESS traffic rules, to apply to all amateur radio operators in the city, were approved recently by the Syracuse Amateur Radio Association.

The rules provide that every transmitting station must have a government license, which is granted to operators making application.

In regard to sending, the rule is that the air shall be free for all kinds of sending from midnight until 6 P. M. on week days.

From 6 P. M. to 9.45 P. M. sending may be done by spark coil sets only, and from 10.05 to midnight the only sending that may be done is what is called DX work, relaying messages for long distances. No sending may be done from 9.45 to 10.05 because that is the time when government stations are sending out reports, etc.

The Sunday schedule states that the air shall be free from 12 P. M. to 6 A. M. and that DX work shall be done from 6 A. M. to 12 M. From noon until 6 P. M. the air shall be free, and from then on the same schedule shall be observed as on week days. The only exception to these rules is that C.W., or continuous wave sets, 10 watts or under, may send at any time.

The Syracuse Amateur Radio Association has about 100 members, who meet the second and fourth Saturday of each month at their rooms in the store of the Hughes Electrical Corporation. All persons interested in radio work may join. The officers are Robert Moore, president; Robert Winchester, traffic manager; Andrew Potter, secretary, and Richard Hallenback, corresponding secretary.

Δ Δ

MR. ERNEST STIDHAM was elected president of the Peoria, Ill., Radio Club on January 10 at a meeting in the police court rooms, city hall.

Other officers elected were H. Klaus, vice-president; L. T. Bourland, secretary; R. Z. Brown, sergeant-at-arms.

Δ Δ

SATURDAY, January 14, was "Radio Day" on the Union College campus, when all the amateur radio operators within a radius of 50 miles, numbering over one hundred, were guests of the Union College Radio Club at their radio exhibit and inspection tour of the General Electric Company's plant. The guests met at the main entrance of the General Electric at 10.30 A. M., and were taken for an inspection trip of the works, especially building No. 40, the radio building. They were divided into squads of twenty each. At noon the guests were entertained by the company at luncheon at the restaurant on the grounds.

At 1.30 the delegates assembled on the Union College campus and visited the radio exhibit in the College Union under the direction of the Union College Radio Club. Many interesting types of radio apparatus were on display. At 2.30 Dr. Peter I. Wold of the physics department of the college gave a lecture on "Vacuum Tube Operations," giving a demonstration of a crystal of rochelle salt being used as a phonograph tone arm. Following this was an address by C. C. Estey, of Salem, Mass., former organizer of the American Radio League. He outlined the plan and purpose of the Schenectady District Executive Council that was formed.

A banquet was enjoyed in the College Union at 8 o'clock, Ralph Bennett, '21, Union, being toastmaster. Among the after-dinner speakers were W. R. G. Baker, of the General Electric Company, on "Transmission," and A. F. Van Dyke, of the same company, on "Radio Receivers," of which he has made a special study.

The Union College station, whose call is 2XQ, is being highly complimented for sponsoring this move to form a council of the amateur radio operators of the Schenectady community.

Δ Δ

AT the first regular meeting of the Schenectady Radio Association, C. B. Roberts was elected president. The other officers are: L. S. Beebe, first vice-president; James F. Burns and Henry W. Peck, vice-presidents; H. B. Wilson, secretary, and W. S. Borcell, treasurer.

The president appointed a constitutional committee to draw up a code with by-laws, and when ready for adoption, notices will be given broadcast by radio and the press.

Prize Contest Announcement

The subject for the new prize contest of our year-round series is:

Best Complete Receiver for picking up the Broadcasting programs.

Closing Date 'April 1, 1922

Contestants are requested to submit articles at the earliest practical date.

Prize winning articles will appear in the June, 1922, issue.

All manuscripts should be addressed to the Contest Editor of The Wireless Age.

Reception of the Broadcasting Stations' daily programs is becoming more popular every day. The newcomer wants to know "What is the best kind of apparatus to use?" You tell them, amateurs. It's up to you.

PRIZE CONTEST CONDITIONS—Manuscripts on the subject announced above are judged by the Editors of THE WIRELESS AGE from the viewpoint of the ingeniousness of the idea presented, its practicability and general utility, originality and clearness in description. Literary ability is not needed, but neatness in manuscript and drawing is taken into account. Finished drawings are not required, sketches will do. Contest is open to everybody. The closing date is given in the above announcement. THE WIRELESS AGE will award the following prizes: First Prize, $10.00; Second Prize, $5.00; Third Prize, $3.00, *in addition to the regular space rate paid for technical articles.*

At the meeting a card index was made of the operators, tabulating the kind of apparatus known, both those with receiving sets alone, and those equipped to send messages.

Δ Δ

MR. PAUL F. GODLEY will deliver an address on wireless at the High School auditorium, Morristown, N. J., on March 17, at 8 P. M., under the auspices of the Science Club of the school. All interested are invited to attend.

Δ Δ

THE amateur radio station of Robert Doscher, Glen Head, L. I., which was located in a separate small building, was entirely destroyed by fire on the night of February 13. An overheated stove caused the fire, which spread so rapidly that the entire building and contents were destroyed before the arrival of the fire department.

Δ Δ

THE Bonham, Tex., Radio Club has recently installed a new receiving outfit and loud-speaker in its club rooms.

Δ Δ

THE First Annual Radio and Electrical Convention will be remembered by the fifty-two wireless amateurs that attended the exhibit and helpful session at the Y. M. C. A., at Pottsville, Pa., early in January.

The opening business session was impressive and some very important rules and regulations with the formation of a Tri-County Radio Club with headquarters at Pottsville for the purpose of furthering the interest of wireless among the amateurs of Northumberland, Lebanon and Schuylkill counties. The following officers were elected: President, Frank G. Kear, Jr.; vice-president, Harry Franklyn Schoenfelder. Traffic rules and regulations were prepared, read, and adopted.

The exhibition attracted a crowd of enthusiastic boys, parents and general public and the room was a scene of lively interest all afternoon. George Arthur Wallace operated the static machine.

The session on C. W. was led by Frank G. Kear, convention president, who gave with authority many interesting statements that were new to the delegates. The evening show of high frequency phenomena was a success under the supervision of Charles Potts assisted by Leslie W. Shollenberger.

Δ Δ

AMATEURS of Bergen County, N. J., have formed a club known as the Bergen County Radio Club. Meetings are held every other Tuesday evening. The secretary is Lloyd Cole, Westwood, N. J.

Δ Δ

AT a recent meeting of the Cleveland Radio Association a four-round fight took place between "C. W." and "Spark." "Static" was the referee, and was very active during all rounds. It later developed that the fight was a prearranged affair. The president, E. H. Pood, was responsible for the exciting few minutes.

At the close of the meeting all present inspected a display of apparatus for sale by the various radio supply houses of Cleveland.

Δ Δ

AT a meeting of the Radio Association of the University of Vermont recently the following schedule was adopted:

Whereas, a schedule seems imperative for the proper control of radio communications in this city, the following schedule is submitted for your approval:

6 A. M. to 1 P. M., free air.
1 P. M. to 4.30 P. M., local period.
4.30 P. M. to 6 P. M., daylight long distance period.

(Continued on page 45)

STATIONS WORKED AND HEARD

Stations worked should be enclosed in brackets. All monthly lists of distant stations worked and heard which are received by the 10th of each month will be published in the next month's issue. For example, lists received by November 10th will be published in the December issue. Spark and C. W. stations should be arranged in separate groups.

Distance Records

WHEN signals from a radio station are heard at unusual distances it is proof that the station is an efficient radiator of energy. The location, apparatus, construction and operation of an efficient station is therefore, of great interest to all amateurs, and THE WIRELESS AGE wants this information.

You are therefore requested to send us a monthly list of distant amateur stations heard, which will be published regularly. Report only stations located 200 miles or more distant from your station. Arrange the calls by districts in numerical order.

State whether the stations heard use a spark or C. W. transmitter. THE WIRELESS AGE will follow the records closely and whenever possible will secure and print illustrated articles on the stations consistently heard over long distances, for your benefit and the benefit of amateurs.

If a station is an efficient radiator of energy, it should be given proper credit in the history of amateur progress, and at the same time you will be given credit for efficiency in receiving in having heard it, as your name, address and call letters will be published with all lists submitted by you.—THE EDITOR.

CALLS HEARD IN HAWAII

Air Service Radio Station XF1, Langley Field, Va. (near Norfolk), which is in the amateur range of wavelengths, and which has been doing quite a bit of amateur relay work, has been heard at Station 6ZAC, in Hawaii, during daylight.

The input of the C. W. set of XF1 is about 500 watts, and the antenna current between 5 and 6 amperes, on 375 meters. The antenna is of the umbrella type, with an elevated counterpoise.

The log of Radio Station 6ZAC, Clifford J. Dow, Wailuku, Hawaii, is interesting, in that it includes reception of signals from a number of U. S. Stations in addition to XF1.

Dec. 26—5.55 pm., 7ZB de 7ZP, "R Nil hr OM. QRK? K"; 5.58 pm., 6AK de 7ZP "Mugs"; 5.58 pm., 7ZV de 7ZU.

Dec. 26—5.15 pm., 7ZJ working 7ZP; 5.25 pm., 7ZP de 7ZJ "QSA OM QSR 2 QRK?" 5.30 pm, 7ZP de 7ZJ; 5.31 pm, 7ZP de 7ZJ; 5.33 pm, 7ZS-4GL-8ZP de XF1 cw; 5.34 pm, 4GL de XF1; 5.36 pm, 4GL de XF1; 5.40 pm, ? ? ? de 5XU (QRM arc); 7.20 pm, 6ZAF de 7ZJ; 7.22 pm, 7ZJ de 6ZAF; 7.23 pm, 6ZAF de 7ZJ; 7.25 pm, 6ZAF sending to 7ZJ; 7.26 pm, 7ZJ de 6ZAF; 7.32 pm, 5QA de 6ZB; 7.37 pm, 6ZX de 6ZAF; 8.05 pm, 6AIF de 5QA; 8.06 pm, 6AIF de 5QA; 8.07 pm, 6AIF de 5QA.

1ZE, Irving Vermilya, Marion, Mass. (January).

(1BIU), (1BQE), 1AW, (1AEV), (1AFV), (1BAS), (1BIR), (1BES), (1CLI), (1AZW), (1CIT), (1AKB), (1BCF), (1BKR), (1BKQ), (1BDI), (1BEA), (1BJW), (1CDR), (1CDP), (1BQA), (1ARY), 1CK, 1TS, 1BDT, 1UN, 1FB, 1XE, (2ZL), (2AAB), (2VA), 2FQ, 2AN, (2WP), 2BRC, (2BML), (2AWF), (2FP), (2AJW), (2OM), (2BK), 2NZ, 2AAC, 2AGB, 2XQ, (3HJ), (3AUF), (3FS), (3FM), 3XL, (3LK), (3CC), (3CN), (3ZO), 3ZE, (4BY), 4CB, 5ZA, 8NI, (8AWP), (8BRL), (8KH), (8JS), 8LX, 8AGZ, (8JL), 8JE, 8DE, (8ZG), (8BUM), (8IL), 9ZN, 9VV, 9ZJ, 9AAW, (3BP) Canadian, WDY, WJZ, KDKA, WBZ, DF1, AN5.

2OM, F. B. Ostman, 180 Broad St., Ridgewood, N. J. (January).

1AFZ, (1AMD), (1APO), 1ARO, (1ARY), (1ASF), (1AW), (1AZK), 1BCF, (1BDT), (1BDV), 1BJE, 1BOE, 1BQA, 1BQL, (1BVB), 1BVH, 1BWY, (1CC), 1CHJ, (1CK), (1CM), (1CNI), (1CP), (1CZ), (1DY), (1DZ), (1EV), (1FM), (1GM), (1HK), (1LZ), (1OE), 1ON, (1RV), (1SN), (1WQ), 1YB, 1YD, 2ANM, (2AWF), 2BY, (2GK), (2OO), (2PV), (2SZ) Canadian, (3BP), (3EI), (3GE), (3GN), 3KG, 3ABB, (3AC), (3ACE), (3AHF), (3AHK), 3AHQ, (3AJD), 3AK, (3ALN), (3AQR), (3ARM), (3ARN), 3ASH, (3ATZ), (3AUW), (3BFU), 3BJM, 3BJP, (3CC), (3CG), (3CI), 3CX, 3DM, 3DN, 3FB, 3FP, 3GM, 3HB, (3HG), (3HJ), (3JL), (3KM), (3LP), 3NB, (3OU), 3PB, 3PU, 3QD, 3QF, (3QN), (3TA), (3UC), (3UD), (3UQ), 3US, 3UX, (3VW), 3XC, 3XF, (3XM), 3YV, (3ZA), 3ZF, (3ZZ), (4AG), 4BC, 4BG, 4BI, 4BQ, (4BX), (4CX), 4DC, 4DH, (4EA), 4FD, 4GN, (4XC), 5DA, 5EA, 5ER, 5EK, 5FJ, (5FV), 5HK, 5IR, 5JD, (5PY), (5XA), 5XK, 5ZL, 5ZAF, 8AAV, (8ACQ), (8ADE), (8AFA), 8AFB, (8AFD), (8AFG), 8AHK, (8AHH), (8AHS), 8AHY, 8AID, (8AJT), (8AJW), (8AKQ), (8AMB), (8AMZ), (8ANO), 8ANV, 8ANW, 8APB, 8AQP, (8AQV), (8ARD), (8AVO), (8AVT), (8AXN), 8AXO, 8AXY, (8AYN), (8BBO), (8BBU), 8BBY, 8BCK, 8BDK, (8BDY), 8BEP, 8BGT, 8BHV, (8BO), (8BRL), 8BSY, 8BUN, (8BUM), 8BWI, (8BXC), (8BYM), (8BYP), (8CAY), 8CEB, 8CEJ, 8CG, (8CP), 8CQ, (8DY), (8EA), (8EB), (8EW), 8FI, (8FT), 8HG, (8HR), 8ID, (8IN), (8JJ), 8KH, 8KK, 8KU, (8KY), (8LH), 8LI, (8MZ), 8NO, 8NZ, 8PE, 8PL, 8QC, 8QQ, (8SP), 8TJ, 8TK, (8TT), 8TY, 8UC, (8UP), 8UH, 8VL, (8VW), (8WD), (8WE), (8WO), 8WZ, (8XE), 8YAA, 8YM, 8YN, (8ZAC), (9AAW), 9AAY, 9ABV, 9ACB, 9ACL, (9ACY), 9ACZ, 9AEK, 9AFF, 9AFK, 9AFP, 9AFX, 9AGR, 9AIF, 9AIG, (9AIR), 9ALP, 9ALS, 9AMG, 9AOE, 9AOJ, (9APS), (9APK), 9AQV, (9ARG), 9AR, 9ARY, 9ASK, (9ASN), (9AU), 9AV, 9AWU, 9AWX, (9AWZ), 9AYH, 9AZA, (9AZE), (9BP), 9DBW, 9DCX, 9DEH, 9DHZ, 9DIW, (9DKV), (9DLX), 9DMJ, 9DPH, 9DQY, 9DRJ, 9DSO, (9DUG), 9DWJ, (9DWP), 9DXM, 9DYU, 9DZI, 9DZY, (9CP), 9FS, 9GN, 9HM, 9HR, (9JQ), 9LF, 9LZ, 9ME, 9OU, (9OX), (9PS), 9OH, (9TL), (9UH), (9UU), 9VL, 9WZ, (9WT), 9ZY,

C. W.—1ADI, 1ADR, (1AFV), 1AIP, 1AMO, (1AMS), 1ANO, 1ARY, (1AVI), (1AVR), (1AWB), 1AXD, (1AZW), (1BDI) (1BEA), 1BES, (1BKQ), 1BIR, (1BWJ), 1BWY, (1CAK), 1CIV, 1COA, (1ES), (1GV), 1QN, (1RD), (1RZ), 1TS, (1XM), (1XX), (1ZE), (2XQ), 3AAD, 3ADT, 3AQH, (3AQR), 3ARD, (3BEC), 3BLF, 3BQ, 3BZ, (3CC), (3CQ), (3DH), (3EM), 3FS, 3GH, 3HG, 3HJ, 3HQ, 3IE, 3KS, (3KM), (3MO), 3NJ, 3QV, (3RF), 3RW, 3YP, 3ZO, 3ZY, 4BQ, (4BY), 4DC, 4FT, 4GL, 4GX, 4HW, 4II, 4ID, 4ZE, 5DA, 5EK, 5FV, (5UU), 8ADG, 8AGO, (8AGZ), 8AIO, 8AKJ, 8AKP, 8ALB, 8AMD, 8APW, (8AQV), 8AQF, 8ARU, 8AVO, (8AWP), (8AWY), 8BA, (8BEF), 8BEX, (8BFX), 8BJV, 8BK, 8BO, 8BOX, 8BRL, (8BUM), (8BWK), 8BZC, 8BZY, 8CGT, 8GV, (8HJ), 8IH, (8II), 8IQ, (8IV), 8JL, (8JQ), (8JS), 8LJ, (8LX), 8NB, (8NI), (8QM), 8RQ, (8SP), 8UO, 8VT, 8XH, 8XV, 9AAS, 9AAY, 9AJA, 9AJH, 9AKD, 9AKR, 9BAP, 9BIG, 9DWJ, 9EI, 9GK, 9IL, 9NX, 9PG, (9UC), 9ZB, (NZO), (XFI), (X4L).

2BAK, Joseph B. Slavin, Old Post Road Garage, Tarrytown, N. Y. (February).

C. W.—1QN, 1RZ, 1ZE, 1BEA, 3BG, 3BZ, 3CC, 3FS, 3GB, 3HG, 3HJ, 3HX, 3KM, 3RF, 3RW, 3YP, 3ZN, 3ZO, 3ZY, (3XM), 3AAE, 3ADT, (3AQR), 3ASV, 3BKA, 3BLF, (4BY), 4CO, 4FT, 4GL, 4ID, 4ZE, 4ZL, 5AN, 5BJ, (5FV), (5UU), 8BK, 8DR, 8TL, 8JW, 8LX, 8SP, 8XV, 8ZR, (8ZV), 8AGO, 8AGZ, 8AHH, 8AJY, 8AKQ, 8AQF, 8ARW, 8ASB, 8AUO, 8AWP, (8BEX), (8BFX), (8BOX), 8BRC, 8BTP, 8BUM, 8BUN, 8CFP, 8EXI, 9AT, (9PG), 9NX, 9TJ, 9AAS, 9AAV, 9AJA, 9AJH, (9BED), DF1, NOF-phone, NMW, KDKA-phone, WBZ-phone, WYCB, XF1.

2NE, A. H. SAXTON, Jersey City, N. J. (January). On a single tube.

C. W.—Canadian 3BP, 1AFV, 1AIP, 1AJP, 1AKB, 1AKC, 1ARY, 1AWB, 1AXD, 1AYL, 1AZW, 1BCF, 1BDI, 1BDW, 1BEA, 1BES, 1BKK, 1BKQ, 1BKR, 1BSD, 1BSM, 1BWJ, 1BYK, 1CAK, 1CDR, 1CGS, 1CHW, 1CJH, 1FF, 1QG, 1QN, 1TS, 1UN, 1XJ, 1XM, 1XX, 1ZE, 2AJP, 2XQ, 3ADT, 3AHK, 3BA, 3BC, 3BEC, 3BLF, 3FS, 3HG, 3HJ, 3MO, 3RW, 3YP, 3ZO, 3ZY, 4BQ, 4BY, 4CO, 4EL, 4FT, 4GL, 5UU, 8ADG, 8ADR, 8AGL, 8AGO, 8AGZ, 8AHR, 8AIF, 8AIL, 8AIO, 8AMK, 8AQP, 8AQO, 8AWP, 8AXB, 8AXC, 8BBK, 8BFX, 8BEF, 8BK, 8BO, 8BOW, 8BOX, 8BRL, 8BUM, 8BXH, 8CEH, 8EA, 8EB, 8IQ, 8IV, 8JL, 8JQ, 8JS, 8KH, 8KO, 8NI, 8QB, 8SP, 8UK, 8VJ, 8VY, 8WA, 8WR, 8WY, 8XK, 8XV, 8ZAE, 8ZN, 8ZV, 9AAV, 9AJA, 9AJU, 9ASH, 9BBF, 9BED, 9DV, 9DWJ, 9HW, 9NX, 9PG, 9ZB.

Spark.—Canadian 3BP, 1ALK, 1APO, 1ARY, 1AW, 1AZK, 1BCF, 1BDT, 1BHR, 1BOE, 1BQA, 1BRW, 1BVB, 1CHJ, 1CNI, 1CP, 1FM, 1GM, 1HK, 1LZ, 1MA, 1OE, 1OJ, 1ON, 1RV, 1SN, 1WQ, 1XP, 1YB, 1YD, 2AIJ, 2AJP, 2ANM, 2BY, 2GK, 2SZ, 2XQ, 3AC, 3BFU, 3GN, 3KG, 3LI, 3ME, 8AHH, 8AHS, 8AIB, 8AMB, 8AMZ, 8APB, 8ARD, 8AXO, 8AXY, 8AYF, 8AYN, 8BUM, 8BYP, 8FT, 8JJ, 8KY, 8MZ, 8NZ, 8PL, 8UC, 8VW, 8WE, 8XE, 8YN, 8ZAC, 8ZP, 9AAW, 9ALE, 9ALS, 9AMQ, 9AOE, 9APK, 9AR, 9AU, 9AWG, 9AWZ, 9AZE, 9BP, 9CP, 9DKV, 9DLX, 9DQO, 9DSO, 9DWP, 9DY, 9DYU, 9LF, 9OX, 9QH, 9SP, 9UH, 9UU, 9ZJ.

(Continued on page 48)

American Stations Heard by English Amateurs

(*Continued from page* 25)

The antenna used by Mr. Corsham consisted of a single wire, 100 feet long, in the form of an inverted L. Two masts were used, one 20 feet high in a garden, and the other secured to the chimney of the house, the maximum height above ground being 46 feet. The lead-in was taken from the highest point of the antenna. As the receiving instruments were located in a room 20 feet above ground, the free end of the antenna was practically on a level with the receiving instruments. A double earth connection was used, consisting of a single wire running under the antenna wire and grounded at the far end, and a connection was also made to the water piping. Three tubes including a separate oscillator, were used by Mr. Corsham during the test.

The antenna used by Mr. Spence, whose address is Huntley, Aberdeenshire, consisted of a single copper wire 45 feet average height above ground, length of horizontal part 80 feet, with down-lead of 20 feet to instrument room, the latter situated 25 feet above ground. Earth connection was made to the water piping and also to a wire running under the antenna and earthed at the far end. Six tubes were used by Mr. Spence, who states that his station is situated in the middle of a forest, and is particularly badly screened toward the west by sharply rising ground, and also by trees, which are higher than his antenna.

N. A. W. A.

(*Continued from page* 43)

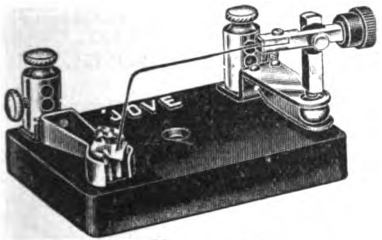
6 P. M. to 7.30 P. M., local period.
7.30 P. M. to 9 P. M., standby for concerts.
9 P. M. to 6 A. M., long distance period.

Subject to change in case of special tests and relays. Δ Δ

MUNROE COX (1CJR), Swampscott, Mass., won the first prize in the Amrad Variometer Name Contest recently concluded. Amrad Basketball Variometer is the name selected by the Committee of Award, and it will be used hereafter in the company's advertising.

Raymond R. Howe, West Lafayette, Ind., with "Minimax," and Wendell J. Reed (1BYL), of Auburndale, Mass., with "XElent" were awarded second and third prizes, respectively. All three prize winners are licensed amateurs. Mr. Cox received two Basketball Variometers and one Basketball Vario-Coupler. The second and third prizes were, respectively, one Basketball Vario-Coupler and one Basketball Variometer.

(*Continued on page* 47)



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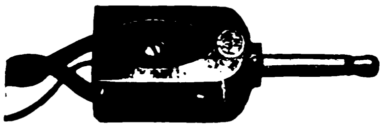

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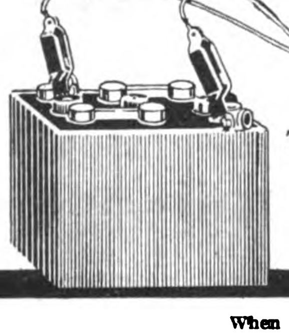

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Canadian Distributors—Rowley & Moody, Ltd., Toronto.

(*Continued from page 44*)

8AP, J. MARTIN SIMONS, Philadelphia, Pa. (January)

Spark.—1AW, 1HK, 1QA, 1BVB, 1ASF, 2DK, 2DN, 2TF, 2TS, 3IW, 3ASC, 3AQR, 8WO, 8BVA, 8FT, 9CP, 9AAW, 9AGR, 9AWX, 9DBE, 3BP, 3JL Canadian.

C. W.—1PE, 1AFV, 2AWL, 2AAX, 2AYZ, 3EM, 3ZO-phone and cw, 4GL-phone, 8I1, 8JQ, 8BUM, XF1.

6TV, CHARLES C. WHYSALL, Los Gatos, Calif. (January).

5BY, 5EW, 5FA, 5FO, 5HK, 5IR, 5IS, (5IF), 5LB, 5MF, 5MK, 5NS, 5OF, 5TU, 5UG, 5XB, 5XJ, 5XU, 5YI, 5YQ, (5ZA), 5ZAF, 5ZAM, 5ZZ,(6AHQ), 6ACY, 6AHA, 6ADL, 6AMK, 6ADA, 6AEH, (6AMN), 6AIB, 6AVB, (6AAU), 6AFN, (6ASV), (6AAH),(6ALU), (6AKL), 6ALV, 6ALE, 6ACR, (6AHA), 6ATG cw, 6ALD, 6ABW, 6AGF, 6AVR, (6ATH), 6AKW, (6AFP), (6AWX), 6ANG, 6AGP, (6AK), 6AS, 6AH, 6BCA, 6BGH, 6CU, (6EN), (6EX), (6EA), 6FH, (6FT), (6GT), (6GP), (6GD cw), (6IV), 6IS, 6JD, (6KS), 6KH, 6KA cw and spk., (6KC), 6KY cw, 6KM, KWG, (6MH), (6MZ), 6NG, (6OD), (6OH), 6OL, (6PJ), 6PS, (6PR), 6QK, (6RS), (6TO), (6TU), 6TF, 6UO,(6VX), 6VK, 6VZ, (6XH cw and spk.), 6XAD cw, (6ZAM), (6ZX), (6ZZ), (6ZR), 7BK, 7FI, 7YA, 7ZO, 9AQE, 9AEG, 9AMB, 9AYS, 9ALU, (9DUG), (9DSD), 9DTH, 9NX cw, 9XAQ.

8WO, Harold I. Brainard, 836 Richmond Ave., Buffalo, N. Y. (January).

(1ABB), (1ASF), 1ARY, 1AW, (1AZK), 1BDT, 1BGF, (1DY), (1RV), (1SN), 1YD, 1ZE, 2AIM, 2ALY,(2ARB), 2AWF, (2BK), (2DK), 2DN, 2EL, 2FD, (2FP), (2HJ), (2JU), (2OM), (2PL), 2TS, 2UE, (3AHK), (3AQR),(3ARM), 3BG,(3CA), 3CC, (3CG), 3DH, 3IW, 3KM, 3NB, (3QN), (3VW), 3XF, (3HG), (3HJ), (3ZA), (3ZM), (4EA), 4AG, 4BQ, 4CO, (4CX), 4DH, 4EY, 5FV, 5HK, 5JD, 5SM, 5ZA, 5XA, 5ZL, 5ZZ, (8AQV), (8ARD), (8AFD), (8AFB), (8AFG), (8AJT), (8AKP), (8AKW), (8ARG), (8ARS), (8AUY), (8AVT), (8AYS), (8AYN), (8BA), (8BAH), (8BFH), (8BRL), 8DR, (8DY), (8EA), (8EF), (8EW), 8EZ, (8FI), 8FT, 8HG, (8HY), (8IN), 8JJ, (8MJ), 8NO, 8OI, 8RQ, 8SP, (8TJ), (8UC), (8YL), (8WE), (8WD), (8WZ), (8YAA), (8ZAC), 8ZW, 9AAJ, 9AAP, 9AAW, 9ACB, (9AGR),(9ATN),(9AVE), (9AKR), (9CP), (9DKQ), (8AWP), 8BRL, (8HJ), (8II), 8SP, 8XX, 8XK, 8ZG, 9AIG, (9DWJ), (9DKV), (9DNC), 9DXM, 9DYN, (9GP), (9HR), 9HM, (9HT), (9JN), (9ME), 9MC, 9PC, 9PS, (9TL), (9TZ), (9UH), (9UG), (9VK), (9WT), (9WI), 9ZN, Canadian (3BP), (3EI), (3FQ), (3GE), (3JL), 3QJ, 8SE.

C. W.—(NOF), NZO, 1ARY, 1AJP, 1BCG, 1UN, (1XM), 1ZE, 2AWL, (2EH), (2KL), (2XQ), 2XX, 3AHK-phone, VY, QSA, 3ZO, 4BQ, 4GL, 5AN, 5FV.

8CP. Orlo Palmer, Holland, Mich., (January).

(2ARB), 2ARM, 2BFU, (2BM), 2BK, 2EL, (2FP), (2JU), 2OM, 2PU, 3AJD, 3BK, (3FB), 4CG, 4CX, 4DH, 4BQ, 4GN, 5BY, 5ER, (5FO), 5HK, 5IQ, 5IS, 5PG, 5TU, 5ZA, 5ZL, 8AAP, 8ACF, (8ACO), (8AFA), (8AFB), 8AFG, (8AIE), 8AIZ, (8AJK), (8AKQ), 8AKV, (8AMZ), 8ANO, 8AOG, 8ARD, 8ARS, 8ATU, (8AUM), (8AUV), (8AVE), (8AVT), (8AXN), 8AXO, 8AYN,(8BAZ),(8BBU), (8BCY), 8BEP,(8BEN), 8BHV,(8BLW), (8BUM),(8BTL), 8BWD,(8BXC), 8BXX, (8ZAA), 8ZAC, 8BA, 8CH, (8EB), 8EF, 8EW, 8FI, 8FT, (8JP), (8JJ), (8NZ), 8OI, 8QQ, (8SP), (8UC), (8YN), (8VY), (8XE), (8WD), 9AAP, 9AAW, 9ACB, (9ACL), (9AEF), 9AEZ, 9AFF, (9AGR), (9AGN), 9AIF, 9AIR, (9AIU), (9AJH), (9ALP), (9ALU), 9AMK, 9AMQ, (9ANO), (9AOH), (9AOJ), 9APK, (9ARZ), (9ASJ), (9ASK), (9AUH), 9AUL, 9AVP, (9AWZ), 9AYH, 9AZA, (9AZE), (9BDS), (9BIJ), (9DAZ), (9DBU), (9DGW), 9DHD, (9DHZ), (9DKQ), (9DKV), (9DLX), 9DLD, 9DMM, 9DQQ, (9DRA), 9DSD, 9DTN, 9DYU, 9DVW, 9DXM, 9DXW, 9DVY, 9DZE, 9DZI, 9DZK, 9AF, 9AR, 9AU, 9AK, 9BP, 9BF, (9CP), (9FS), 9FU, (9GN), (9GX), 9HM, (9IB), 9IZ, 9JN, 9JV, 9LF, 9MC, 9ME, (9MS), 9MQ, 9NQ, 9OA, (9OX), (9OU), 9OR, (9PD), 9PI, 9PJ, (9RC), (9TO), 9TI, 9TL, (9UH),(9UU), (9VL), 9VV, 9WI, 9XI, 9YQ, 9ZN, (Can. 3GN).

8BDB, Joe Hill, 1572 Va. St., Charlestown, W. Va. (January).

C. W.—1AFV, 1ANQ, 1ARY, 1AYL, 1AZW, 1BCG, 1BDI, 1BEA, 1BIQ, 1BIR, 1BKQ, 1CGS, 1DF, 1IV, 1QN, 1UN, 1ZE, (2AAB), (2AJW), 2AJF, 2AWF, 2AWL, 2AYV, 2BAK, 2BAY, 2BFZ, 2BGH, (2BNZ), (2BRG), 2BYG, 2FD, 2QF, 2VA, 2WP, 2ZV, 3AAJ, 3AAO, 3AAY, 3AFU. 3AGK, 3AHK, (3AJD), (3ALO), 3AQR, 3BA, 3BHL, (3BIJ), 3BKX, 3FS, 3GH, (3HG), 3KM, 3OQ, 3RQ, 3ZN, 3ZO, 3ZY, 3BZ, 3SQ, 4BK, 4BT, 4BY, 4CG, 4CO, 4CY, 4EB, 4EH, 4EL, 4EO, 4GX, 4GL, 4ID, 4ZF, 5UU, 5FV, 5AN, 5DA, 5KU, 5AZ, 5EK, 5XN, 5ZX, 6PD, (8AIO), (8AQV), (8AWZ), (8BEF), (8BHX), (8IQ), (8WY), 9AAY, 9AIH. 9ARK, 9BLO, 9BBF, 9BED, 9BIQ, 9DDU, 9DKP, 9DPE, 9DIG, 9DWJ, 9KR, 9SJ, 9LE, 9UK.

N. A. W. A.

(Continued from page 45)

THE Sisterhood of the Temple Beth Elohim is holding a bazaar on March 25, 26, 27 and 28, afternoons and evenings, at the Temple Building, 812 Faile street, Bronx, New York City. One of the features will be a radio exhibit, call letters 2BEC.

△ △

AT a recent meeting of the Irvington, N. J., Radio Club, the officers for the year of 1922 were elected: President, Herman Enderwood; first vice-president, Edward Heim; second vice-president, Herman Fisher; corresponding secretary, H. A. Wien; recording secretary, C. Rassnagle; treasurer, Alfred Oechler; representatives to the Second District Radio Council, Edward Heim and Alfred C. Mills.

△ △

THE call 1FM has been assigned to the Portland Y. M. C. A., Portland, Me. All communications in reference to the work of this station should be addressed to Radio operator, Y. M. C. A., Portland, Me.

△ △

MR. JOHN M. FORSHAY has been appointed district manager of the New York office of the Jewell Electric Instrument Co.

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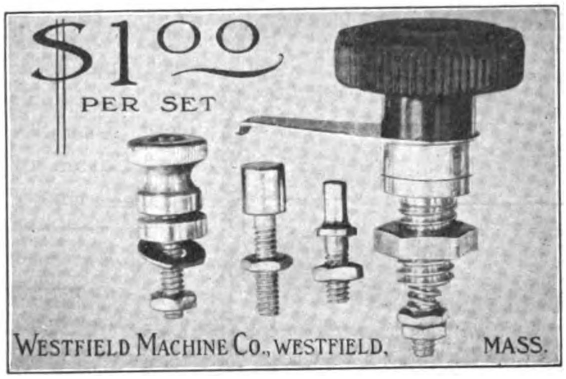

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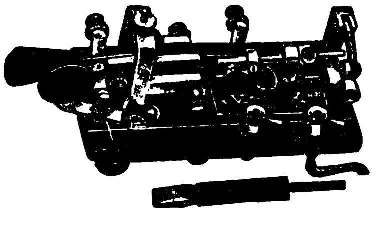

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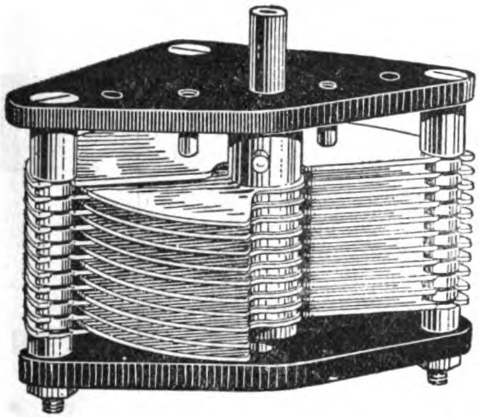

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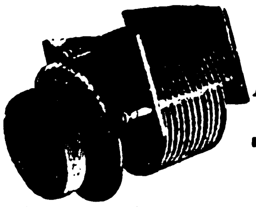

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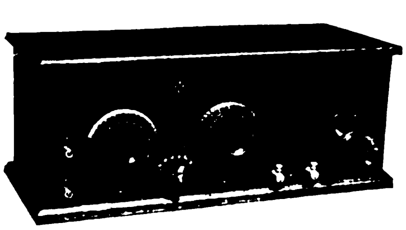

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Queries Answered

ANSWERS will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of one reader can be answered in the same issue. To receive attention these rules must be rigidly observed.

Positively no questions answered by mail.

H. C. J., Mt. Vernon, N. Y.

Q. 1. I wish to wind an electro-magnet two inches in length on a core one-quarter of an inch in diameter to operate on a six to ten-volt current.

Would you be kind enough to tell me the proper gauge wire and the number of layers or turns of wire to use in order to get the greatest magnetic strength?

Ans. 1. Your requirements are rather vague as you state that you wish to obtain the greatest possible magnetic strength. You further do not state the number of amperes which you wish to use.

The number of turns of wire and the number of amperes of current determines the magnetic strength.

Would suggest that you wind your magnet with No. 22 magnet wire and about 10 layers deep, the full length of the core.

J. C. S., Salt Lake City, Utah.

Q. 1. Will you please publish the diagrams of the following circuits mentioned in the article entitled, "Ten Tube Receiving and Transmitting Set," in the January Age?

1. Tube
2. Ultraudion
3. Variometer Regenerative
4. Tickler Feed Back
5. Double Coil Primary

Or if these circuits have been published within the past years in The Wireless Age will you give me references?

To a beginner these terms are somewhat confusing. I thank you.

Ans. 1. The diagrams requested by you have been published from time to time in this magazine, but I suggest you procure a copy of the "Wireless Experimenter's Manual," by E. E. Bucher, from the Wireless Press, 326 Broadway, New York.

P. B. A., Reykjavik, Iceland.

Q. 1. Please give dimensions for a fixed condenser of .002 mfd. using mica as dielectric, to stand 1,500 volts. Give size of plates and thickness of mica in Cm. and Mm.

Ans. 1. A single sheet of high grade mica 3 inches by 4 inches by .002 inch will give a capacity of .004 mfd. and will withstand 1,000 volts, so we would recommend mica sheets 4 inches by 5 inches by .004 inches with conducting material 3 inches by 4 inches, and this will mean four of these condensers connected in parallel. If you cannot obtain mica .004 inches thick you can use two sheets of mica .002 inches thick laid one on top of the other.

Q. 2. How many volts would a paper condenser stand, if paper were soaked in paraffine?

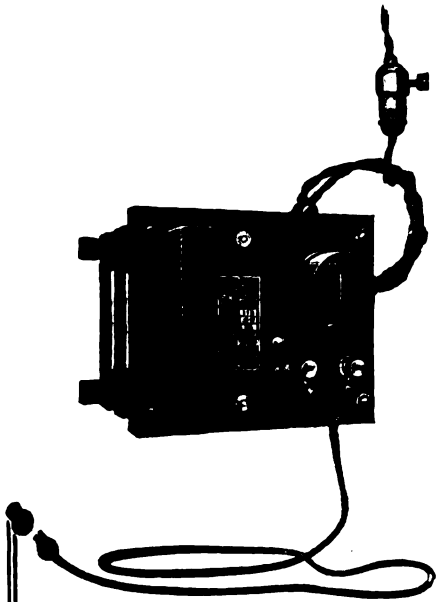
Ans. 2. Approximately 100 volts, depending upon the grade of paraffine.

Q. 3. With what results could the new Radiotron UV-200 and UV-201 be used in connection with a De Forest Amplifier Type P 2 No. 65 and Type P-300?

Ans. 3. Good results.

Q. 4. Would the new transformers manufactured by R. C. UV-712 give much better results?

Ans. 4. Yes, as they are designed to work with the UV-201 tube.



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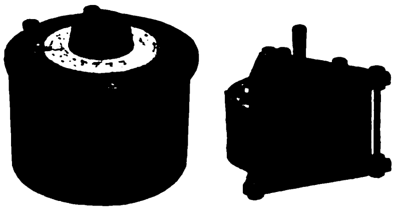

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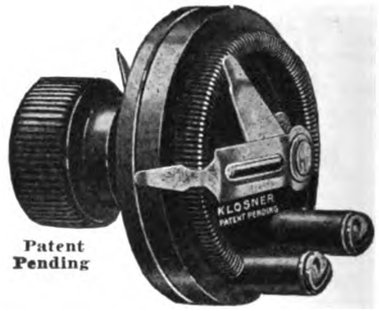

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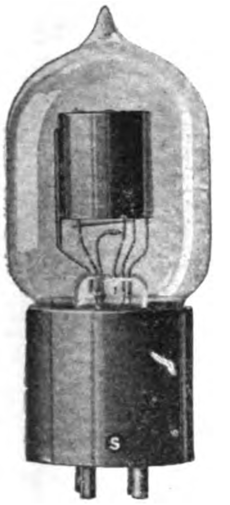

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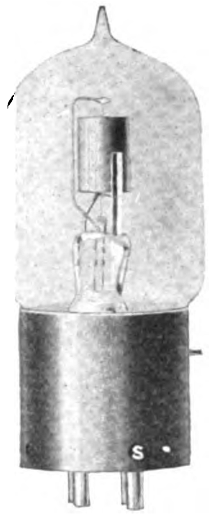

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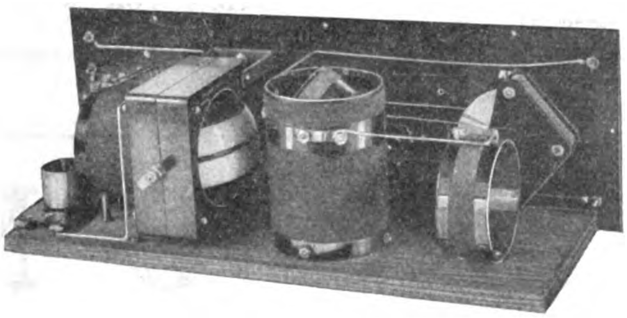

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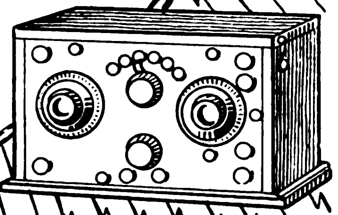

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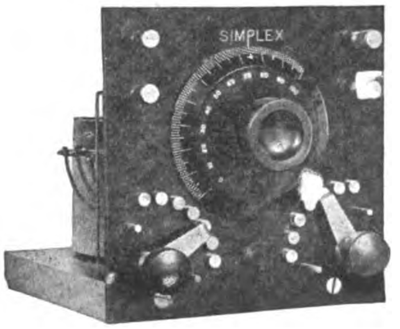

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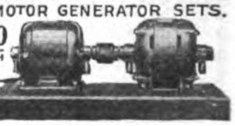

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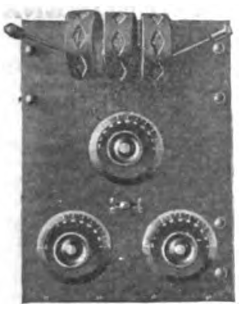
Type "Q" Receiver



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This set is the most flexible receiving set on the market. With the use of the various sizes of Honeycomb Coils everything in the range of radio telegraph and telephone reception from 200 to 25,000 meters is brought into your home. Consists of a three coil mounting, and three Variable Condensers of proper capacity. Tuning extremely sharp. Remler dials.

Price without detector **$35.00**
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A Brief Summary of the Radio Goods Listed in This Catalog

The entire radio catalog of the Radio Corporation, with a wealth of scientific and technical data on C. W. Transmitting sets, and all the diagrams for the assembling of these sets; the complete Remler catalog, which embraces 25 pages, the Westinghouse, Firth, Murdock, Federal, DeForest, Clapp-Eastham, Brandes, Connecticut Company, Thordarson, Turney, Magnavox Company catalogs, the best products of the Adams-Morgan, Signal and countless other manufacturers, including our own complete line of radio apparatus, and many individual items and parts used in radio work today.

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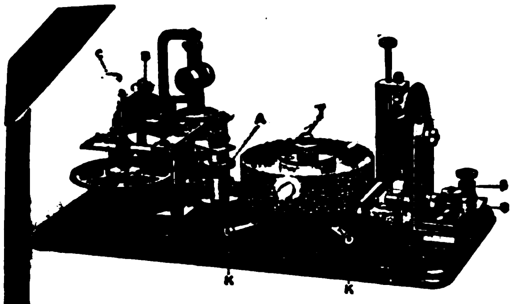

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4341 Richardson Ave.,
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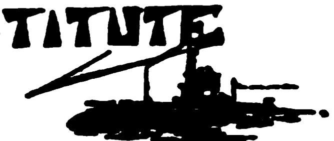

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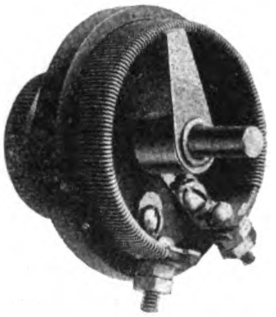

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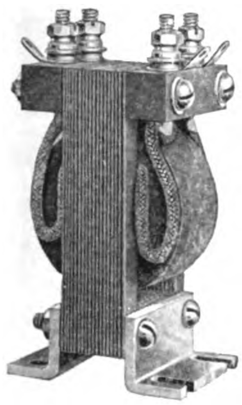

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(Signed)
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On 600 meters I get everything on the Pacific Coast. Stations 1500 to 2000 miles come in very loud. I get ships and 1 K. W. Land Stations in the Hawaiian Islands fine.

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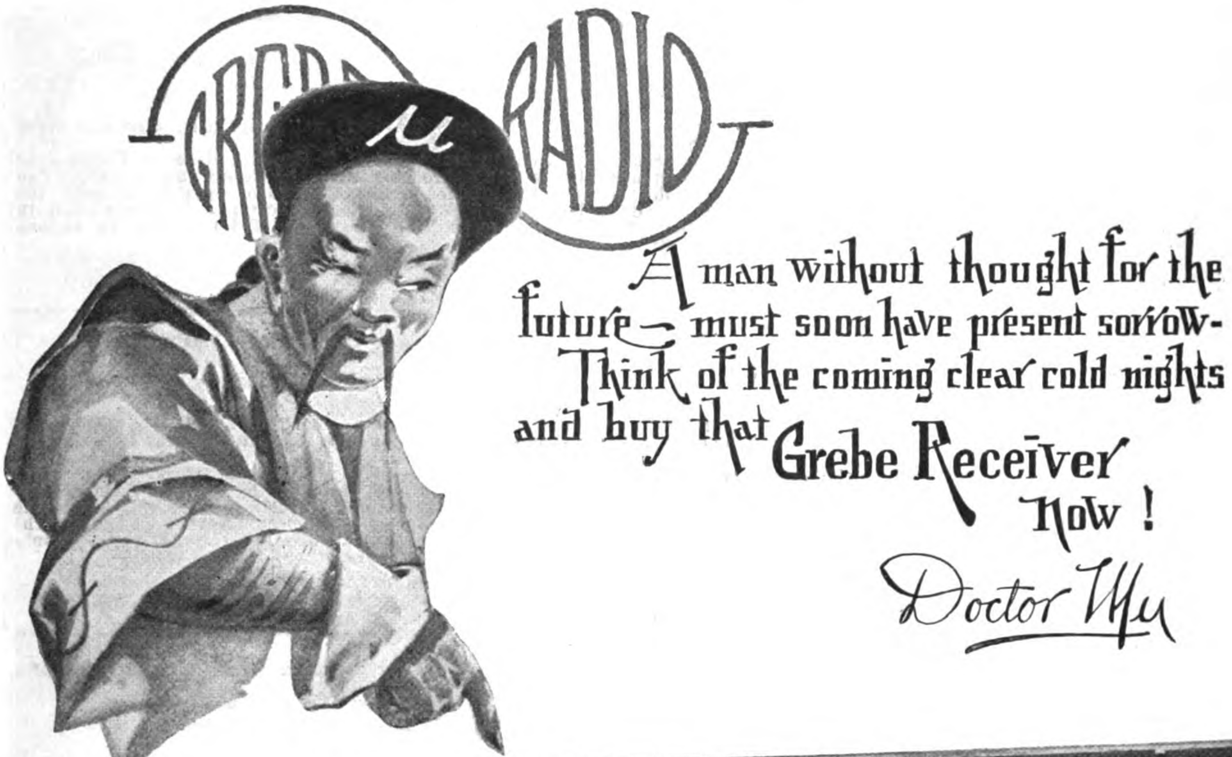
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A man without thought for the future — must soon have present sorrow-
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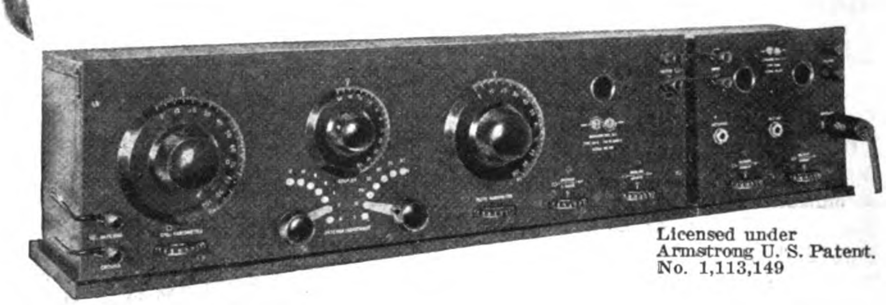

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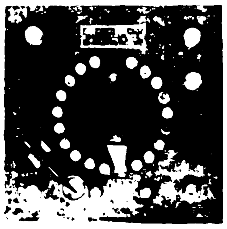

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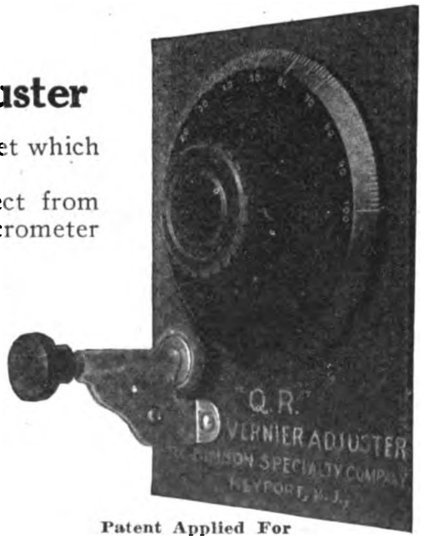

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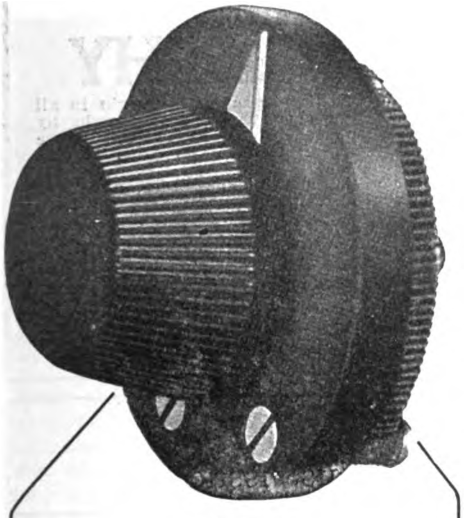

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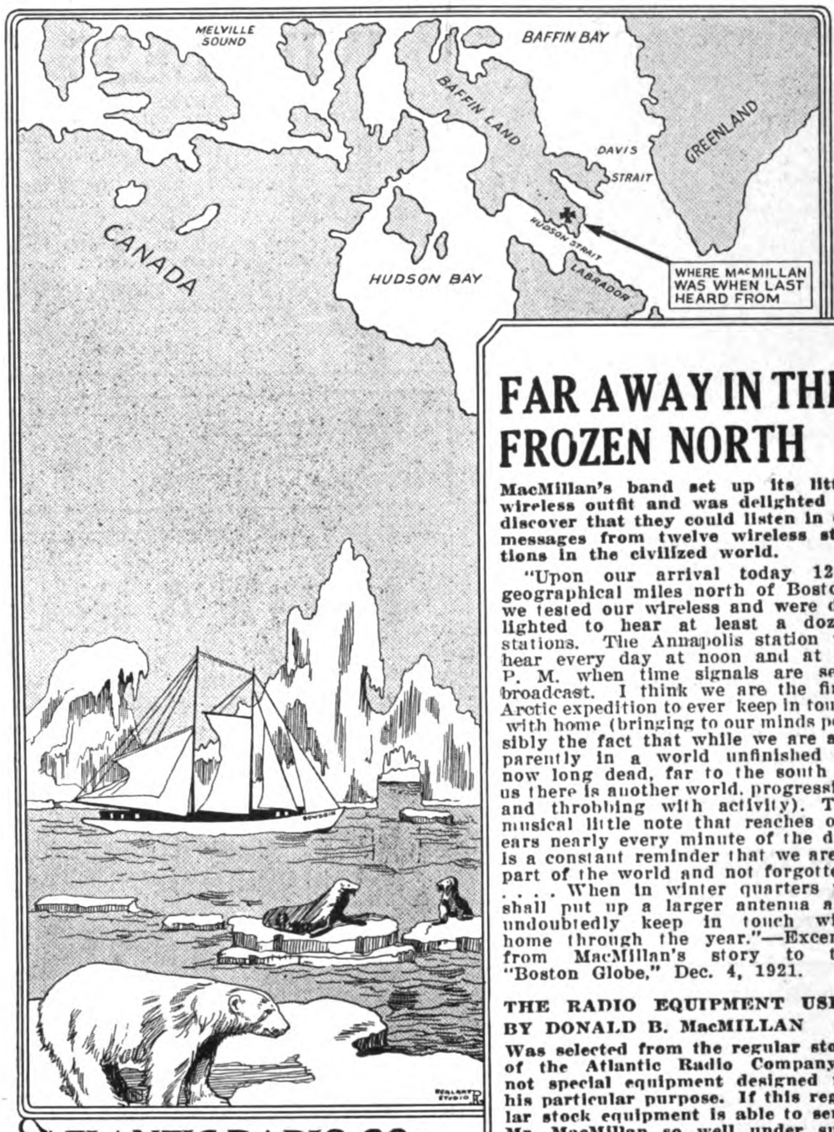

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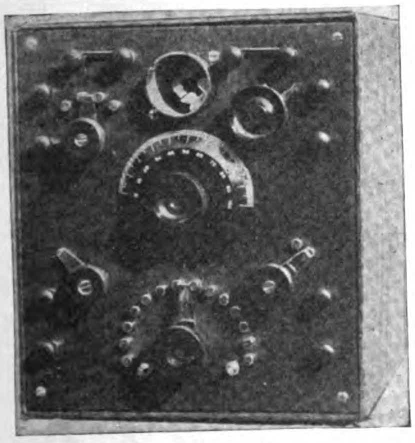

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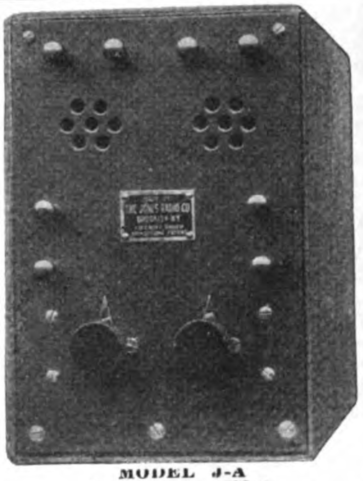

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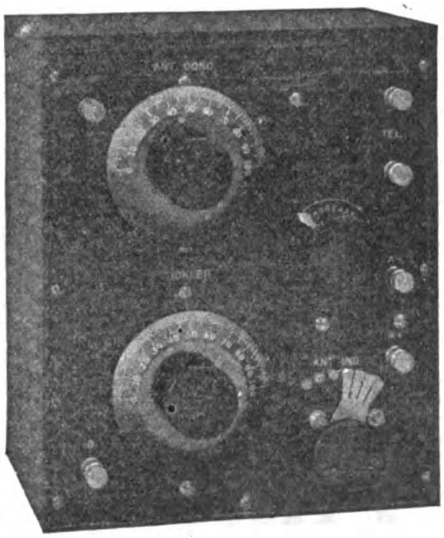

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Panel—Formica, handsomely finished.
Cabinet—Dark oak, oil finish.
Condenser—Balanced type, 2 rotary, 3 stationary plates.
Dials—Indestructible metal. White figures on black ground.
Antenna Inductance—Wound on Formica tube.
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Binding Posts—Nickel-plated brass. Switch—Fan Blade. Rheostat—C-E type H 400
Circuit—Single Circuit regenerative. Licensed under Armstrong U. S. Pat. 1,113,149.

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Send 6c in stamps for a complete Radio Catalog. Each of its three parts describes equally interesting items and it covers every radio essential from the smallest to the largest item.

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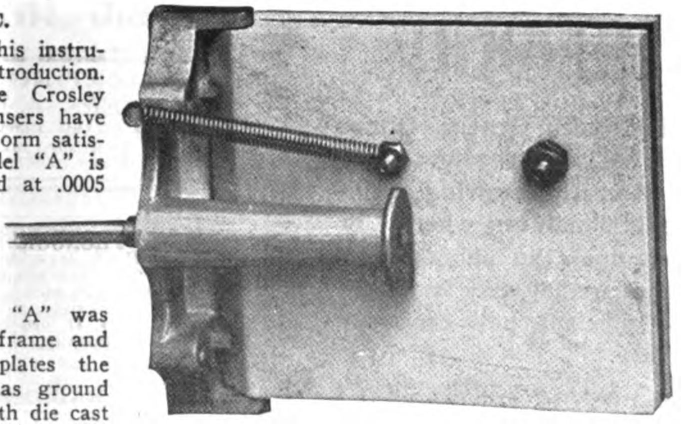

MODEL C.

The principle of this instrument needs no introduction. Thousands of the Crosley Model "A" Condensers have been sold with uniform satisfaction. The Model "A" is conservatively rated at .0005 Mf. The New Model "C" is conservatively rated at .001 Mf.

While the Model "A" was made with wood frame and laminated wood plates the new Model "C" has ground porcelain plates with die cast frame. It is as efficient a piece of apparatus as you could desire. For tuning C.W. and for power transmission it cannot be equaled. It is tested on one thousand volts before shipment. No body or hand capacity. Low resistance due to absence of spring contacts, copper plates, brass binding posts, etc. We call it the "sensation" of radio—"Better——Costs Less."

Every CROSLEY VARIABLE CONDENSER is GUARANTEED to give absolute satisfaction or money refunded.

The CROSLEY VARIABLE CONDENSER is now made in three styles:
Model "A" with wood frame and laminated wood plates.
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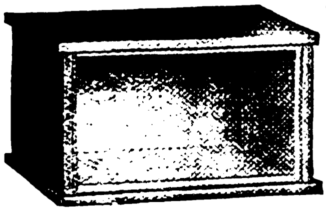
(Both models have the same capacity—.0005)
Model "C" as illustrated—capacity .001—porcelain plates, die cast frame, etc.
Prices as follows:

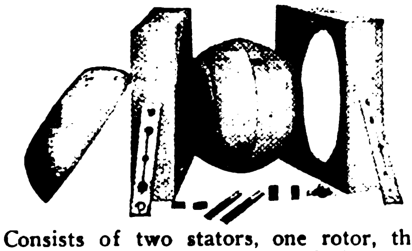
	Without knob and dial	With knob and dial	With knob and dial mounted in cabinet
Model "A"	$1.25	$1.75	$2.50
Model "B"	1.75	2.25	3.00
Model "C"	2.25	2.75	3.50

Crosley Cabinets



We build a full line of cabinets in gum, mahogany or quartered oak and furnish them with genuine formica panels. Prices on cabinets range from $2.50 to $10.50.

CROSLEY VARIOMETER PARTS



Consists of two stators, one rotor, the necessary hardware as shown in illustration. Shaft for knob and dial is 3-16 in. diameter. The wood parts are furnished either in poplar or mahogany. Price of Variometer parts, using poplar wood, $1.50. If wood parts are made of mahogany, $1.75.

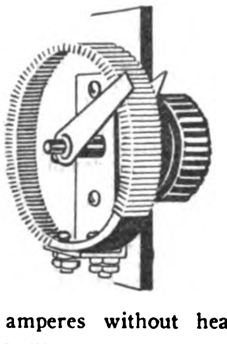
CROSLEY VARIOCOUPLERS

Consists of formica tube, rotor and brass hardware. Price, complete as shown in illustration not wound or assembled $1.50. Stator, only 40 cents.

CROSLEY DETECTOR UNITS

Furnished completely mounted as shown in illustration or in knocked down form. Price completely assembled $7.50. Price of all parts including formica or other panel of high grade dielectric composition, not drilled, $6.00.

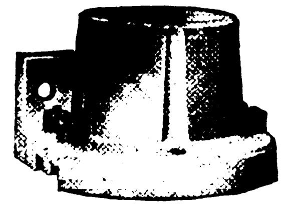
CROSLEY RHEOSTATS



Complete with knob, pointers, etc. as shown in illustration.

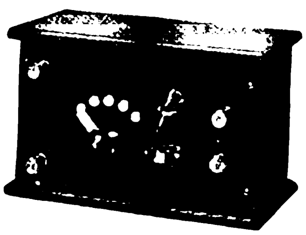
Model "A"—overall diameter 1⅝ in. Resistance 7 ohms, one ampere without heating. Price 60c. Model "B"—Resistance 4 ohms, 3 amperes without heating. Price $1.25.

CROSLEY V-T SOCKET 60c
"Better—Costs Less"



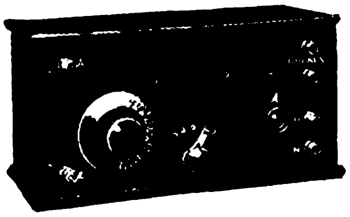
The biggest selling socket on the market. Practically unbreakable. For either base or panel mounting. Made of one piece porcelain; no metal shell, hence no ground hum. Better—and costs only 60c.

HARKO RADIO RECEIVER



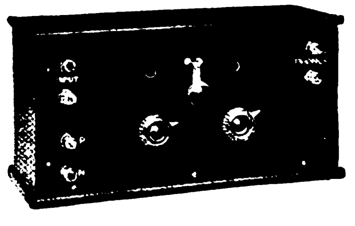
The most compact and complete efficient crystal receiving outfit on the market. Will tune from 200 to 600 meters bringing in spark, voice and music with amateur antenna. A wonderful little instrument. Price complete with battery, etc., $9. One thousand ohm single head set, 125 ft. antenna wire, regulators, etc., $6.00 extra. Complete outfit $15.00.

HARKO SENIOR RADIO RECEIVER



Complete tuner and audion detector assembled on a formica or other high grade dielectric panel, mounted complete in mahogany finished cabinet. Range 150 to 600 meters, non-regenerative hook-up. Price without battery, tube or phones—$16

CROSLEY TWO STEP AMPLIFIER



Complete with amplifying transformers, sockets, rheostats, switch, binding posts etc., mounted on formica panel in mahogany finished cabinet. Price complete as shown in illustration $25.00.

Every article guaranteed to give absolute satisfaction or money refunded. If your dealer can't supply you, send us his name and order direct.

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It will add to your 'phone education.

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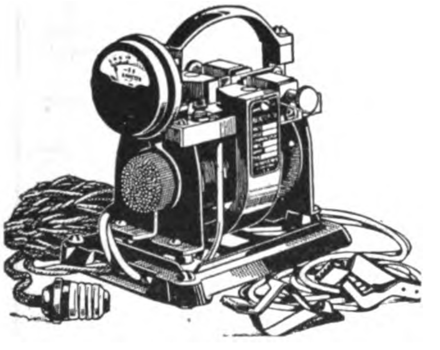
10c CHARGES YOUR STORAGE BATTERY AT HOME WITH AN F-F BOOSTER



Other F-F Battery Boosters Charge Batteries from Farm Lighting Plants & D. C. Circuits. Order Now or Write Immediately for Free Descriptive BOOSTER Bulletin No. 34.

***BATTERY CHARGING STATIONS and GARAGES** Use Our Large F-F **ROTARY RECTIFIERS** for Group Charging. Real Economy in First Cost and in Service. Charges up to 36 cells. Full Wave, Automatic, Dependable. It also Rectifies High Transformer Voltages, For Wireless Work. Write Now for Descriptive **ROTARY** Bulletin No. 34A, which gives full information, or mail Check with Order.*

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Anyone can assemble this outfit and wire it up, and the remarkable ranges that may be obtained will surprise you.

Why not make a set up-to-date and efficient? Don't experiment with unknown circuits.

We will promptly mail you our sample diagram of a complete short and long wave receiver., 175 to 20,000 meters, together with complete instructions for wiring and assembling, price of each part and where they can be bought, leaving nothing to guess about, on receipt of fifty cents in coin or stamps.

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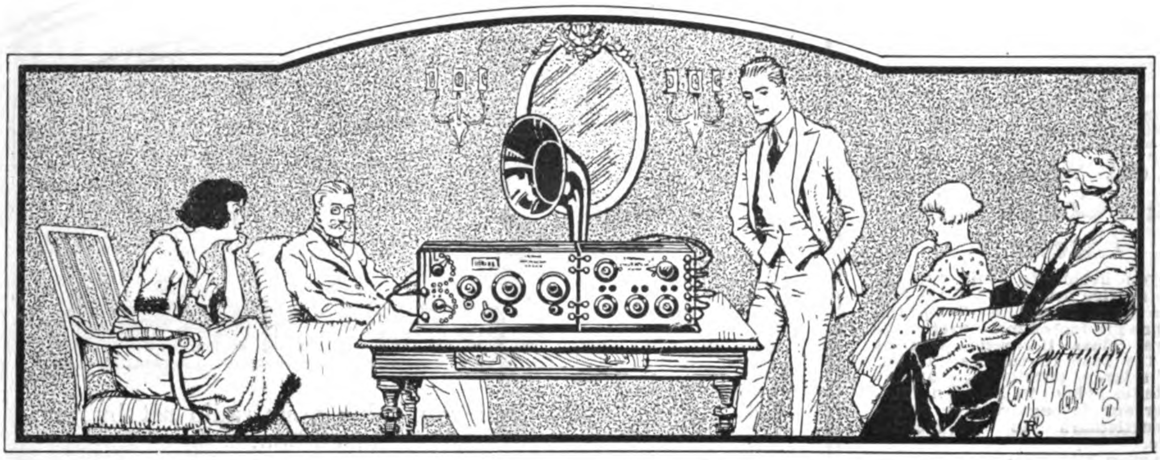

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In response to the tremendous new interest in wireless, created by the sweep of broadcasting stations all over the country, many styles of complete, ready-to-operate outfits have been developed. Continental has carefully selected certain of these sets, of a wide price range, which combine efficient service with simplicity of operation.

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Another low priced but entirely satisfactory set is the Westinghouse Aeriola Jr., at $25.00. This is an easily adjusted crystal detector set, purposely designed to receive the broadcasting. It is so simple to operate and the instructions are so clear that it is practically fool proof. The Westinghouse reputation is back of this efficient instrument which will be found unexcelled for distances of 40 to 50 miles from a broadcasting station. The price of $25.00 includes head phones. The only extras you will need are included in our Antenna equipment Number 1 at $2.00 complete. Thus for $27.00 you can get an outfit complete in every detail. You can put it up in an afternoon and listen to concerts that same evening.

To receive longer distances, it is, of course necessary to have vacuum tube equipment. Most vacuum tube sets are complicated and require considerable technical knowledge. This objection is overcome in the Westinghouse Aeriola Sr. This set employs the Armstrong regenerative circuit, and includes a vacuum tube detector in one handsome, portable cabinet. This outfit, which is far more sensitive and has considerably longer range than the Aeriola Jr. comes to you complete. for $75.00.

For those who want a longer range, sensitive and highly efficient set including a loud speaker, we recommend the following outfit: a Grebe CR-9 receiver, which includes vacuum tube detector and two-step amplifier equipment; one Radiotron detector tube, two Radiotron amplifier tubes, one pair of Baldwin type "C" phones, one Radio Magnavox, 3 "B" Batteries, and one storage Battery. This set has a range of 750 to 1000 miles. Under normal conditions you can hear voices and music by wireless telephone clearly 25 to 50 feet from the loud speaker. It is unusually simple to install and operate. Simply connect your Antenna and ground connections, insert tubes, hook on batteries, and you are ready to listen. The price of this outfit as listed above is $246.00.

For those who want the limit of perfection, there is the Paragon R.A. Ten, for which we are sole wholesale distributors. Many prominent experimenters who have tested Paragon R.A. Ten unanimously report that it is "unexcelled for telephone reception." This receiver employs the Armstrong Regenerative Circuit and is 24 per cent more sensitive and selective than its famous predecessor—Paragon R.A.-6. And the now low price of $69.50 make Paragon R. A. Ten a remarkable value.

For a complete set built around the Paragon R. A. Ten receiver we recommend the following additional equipment: one $65.00 Paragon DA-2 amplifier cabinet, 3 vacuum tubes, 3 "B" batteries, one storage battery, one pair of Baldwin type "C" phones, a radio Magnavox and our number 3 Antenna Equipment. This entire equipment, which gives you a set fully equal in results and appearance to a high class commercial receiving station, is priced at $258.50 complete.

In addition to the sets described above, we also recommend complete sets built around the deForest "Everyman" set at $25.00, the Clapp-Eastham type H-R receiver at $35.00, and the Acmefone at $80.00. Descriptive literature on request.

If you can visit the Continental Store in New York, by all means do so. Come in and listen to the different sets in actual operation. Let our salesmen, who are experienced Radio operators, help you select a set which meets with your particular requirements.

If you live further away, our mail order department is prepared to serve you efficiently. Any of the complete sets described above will be shipped to any part of the United States by express, immediately.

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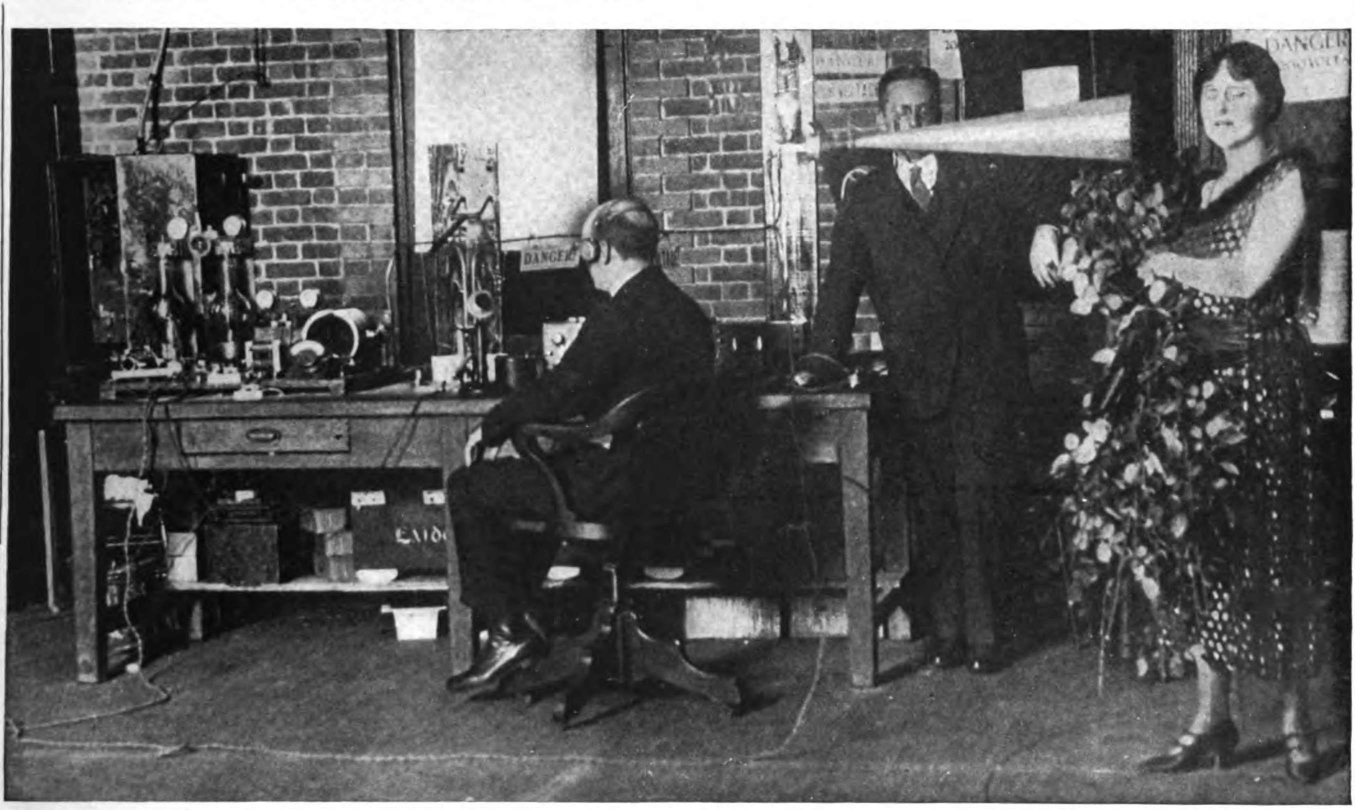

Anna Case, grand opera star from the Metropolitan Opera Company sang "Ave Maria" and "Old Mother, My Love," to the delight of thousands of radiophone listeners

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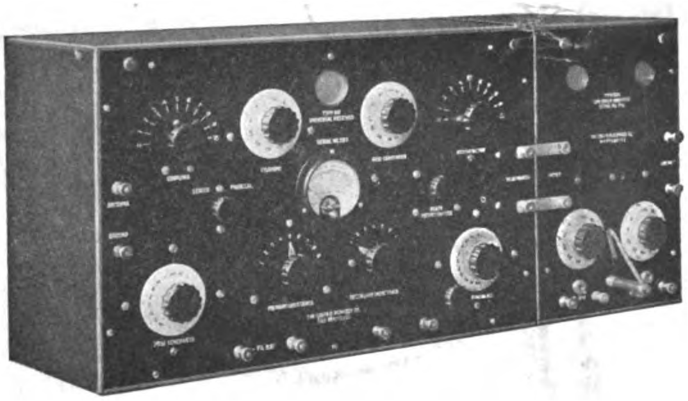

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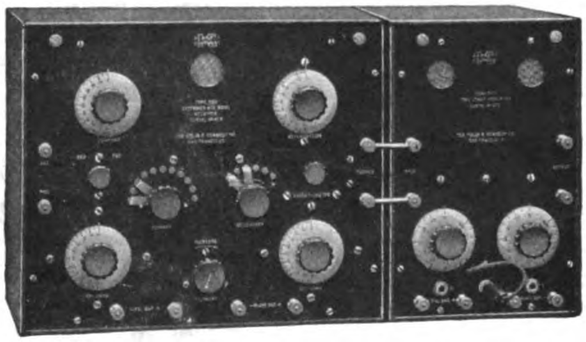
Universal Regenerative Receiver

Effective Range 175 *to* 25,000 *meters with Type* 525

Two-Stage Audio-Frequency Amplifier

Due to its outstanding superiority in design, workmanship and performance, Kennedy Radio Receiving Equipment has attained its reputation as the finest in America.

All Kennedy Regenerative Receivers are licensed under Armstrong U. S. Patent No. 1,113,149



Type 220

Intermediate-Wave Regenerative Receiver

Range 175 *to* 3100 *meters with Type* 525

Two-Stage Audio-Frequency Amplifier

Our trade-mark is the recognized symbol of the utmost in quality and the maximum in value.

Type 281

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Effective Range 175 *to* 620 *meters with Type* 521

Two-Stage Audio-Frequency Amplifier

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THE COLIN B. KENNEDY COMPANY
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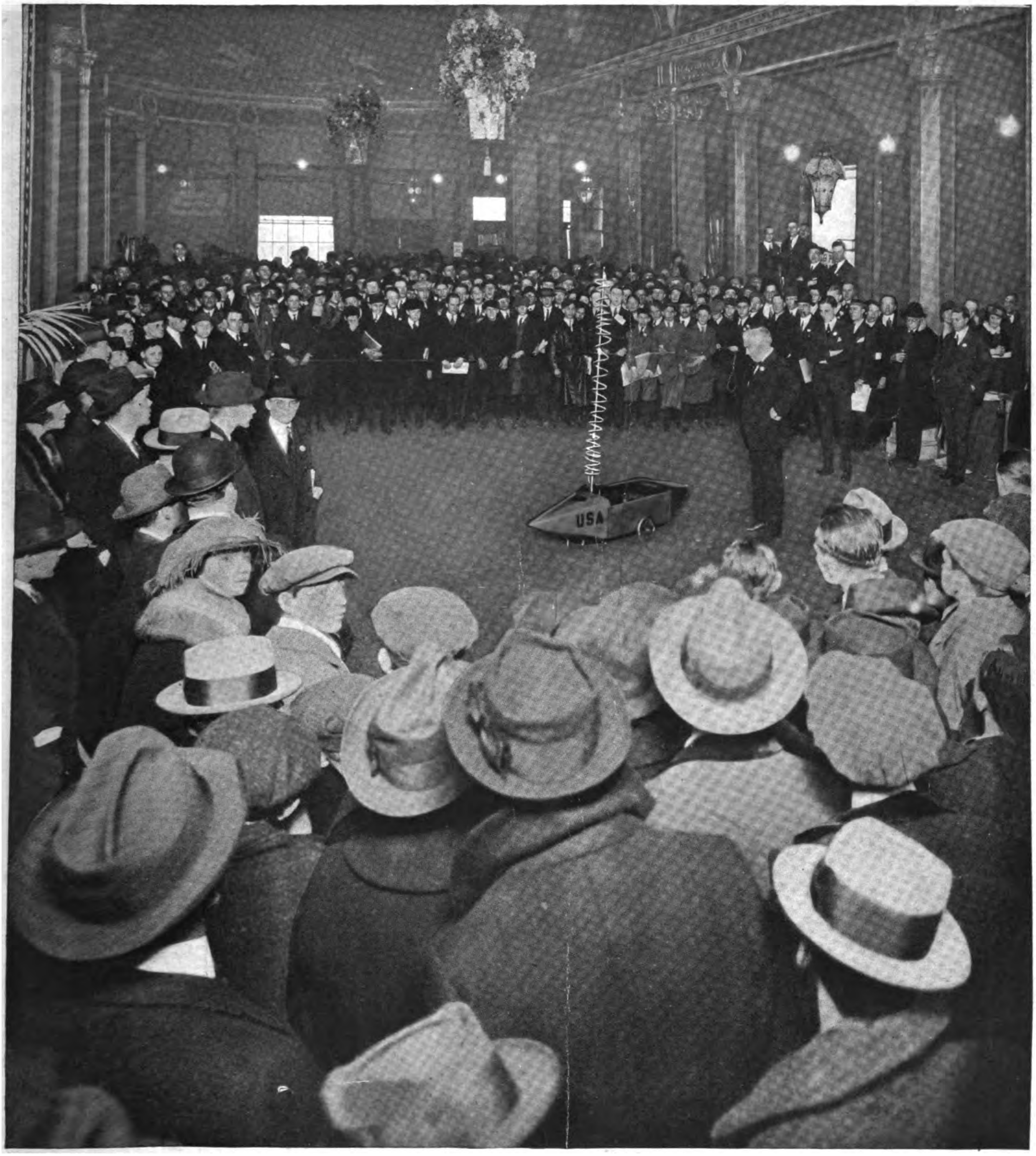
April, 1922

25 Cents

The WIRELESS AGE

Volume 9

Number 7



The present-day public interest in radio is here disclosed in a scene taken at the recent New York Radio Show which had six times the attendance of last year's show

New York's Amateur Show

And Many Exclusive Features In This Issue

Medal and
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received at
World's
Columbian
Exposition
Chicago, 1893

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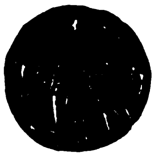
Louis Steinberger's Patents



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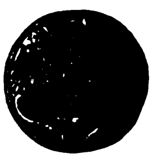
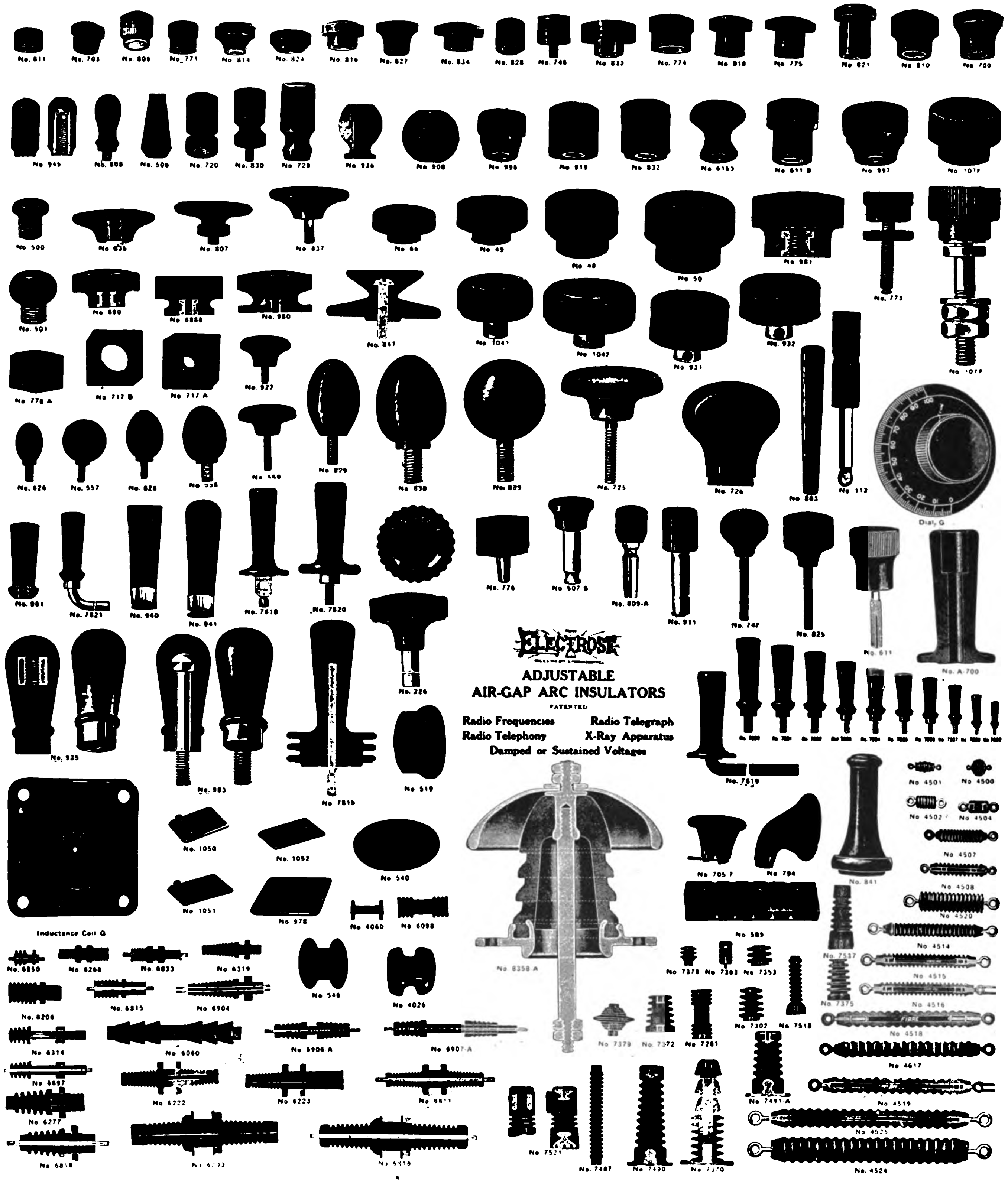
Diploma
received at
World's
Fair,
St. Louis.
1904





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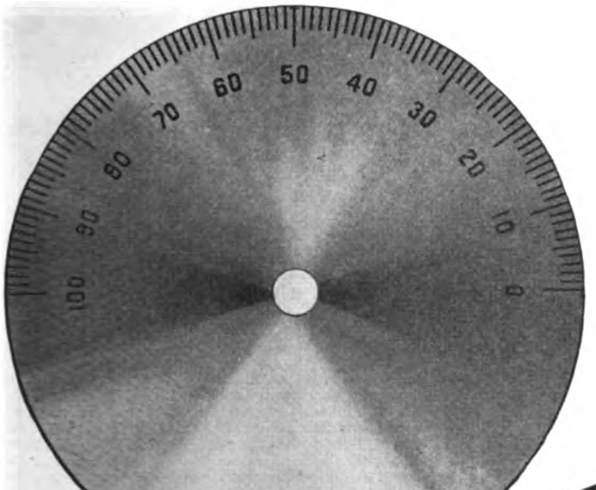
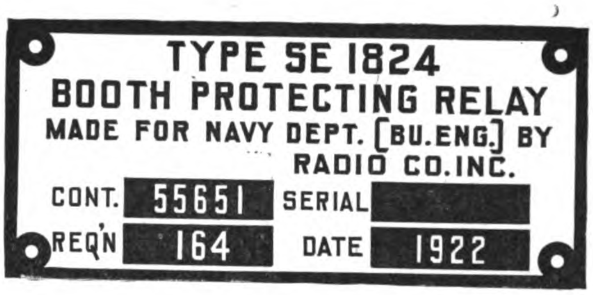


No. 631



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AND
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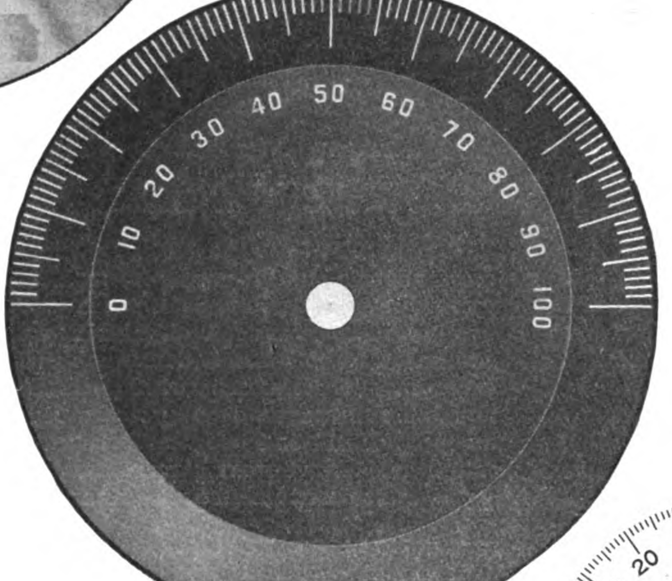

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No. 1373—Made of Brass, with Silver Plated recessions and black oxidized foreground, formed to a 3/8" bevel edge with no cut metal showing on instrument when attached. Size overall 3-1/4" diameter.

With knob, at your dealer .... List $.90 cents each

Also made in 3" and 3 5/8" diam.

Others made in plain brass or Nickel Plated with raised letters on **black, or Silver facing with Black letters, any size.**

No. 631—Made in Nickel Silver—absolutely flat—with Black Enamel design and circular finish polish.

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Edited by J. ANDREW WHITE

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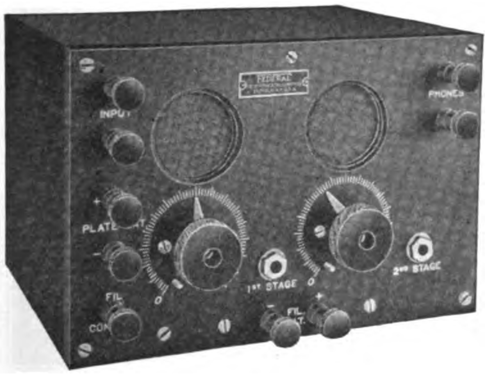

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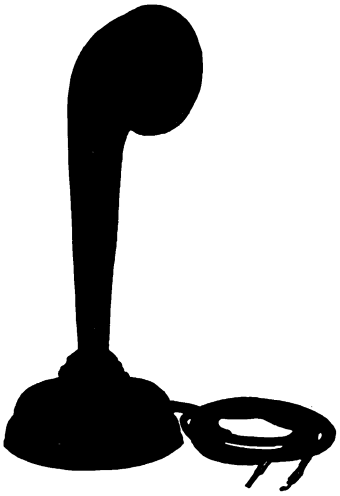

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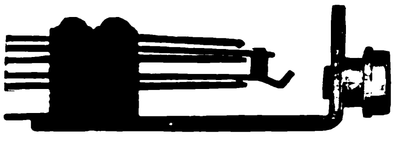

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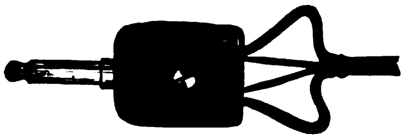

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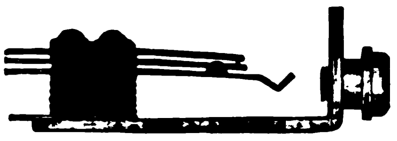

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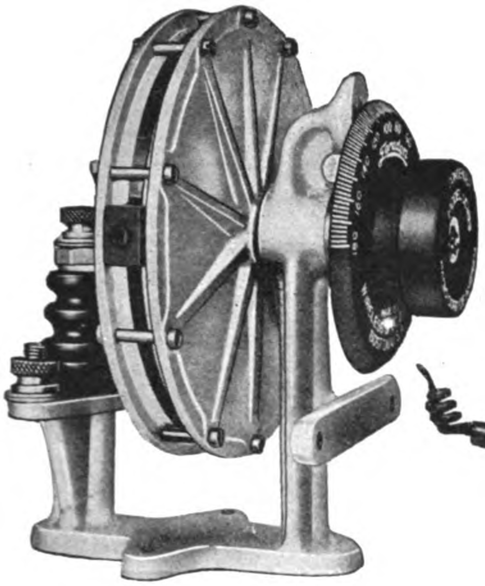

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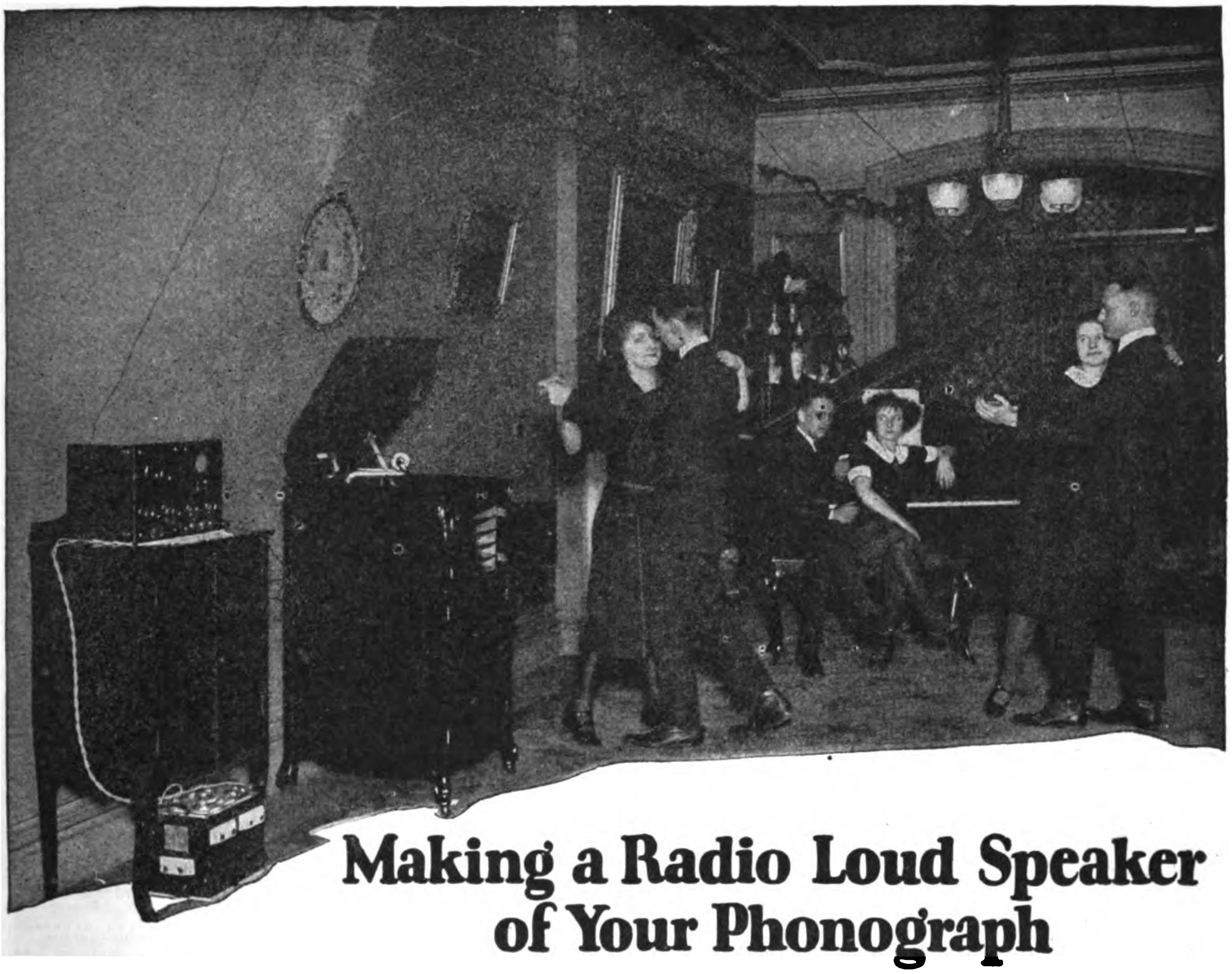

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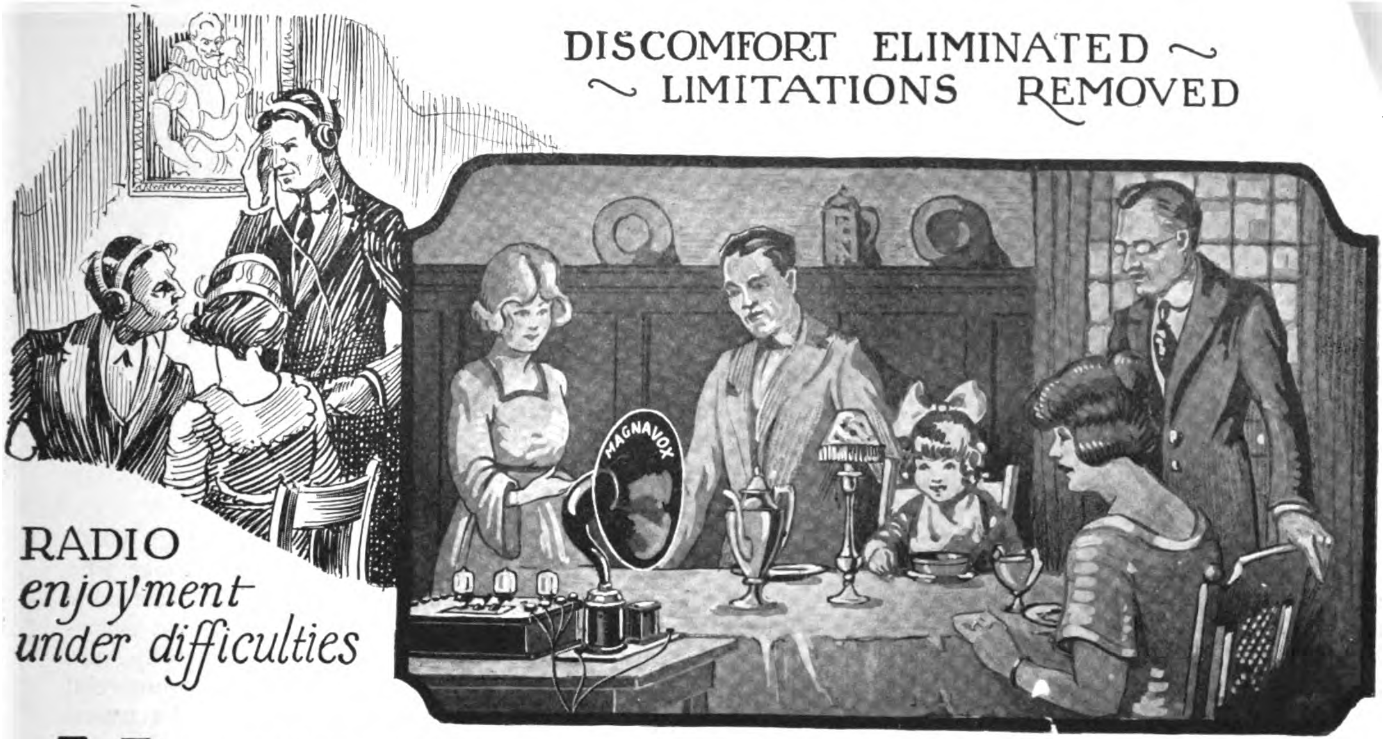

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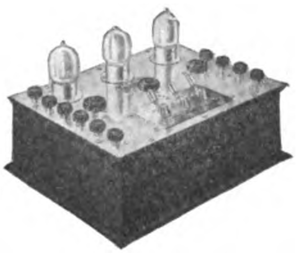

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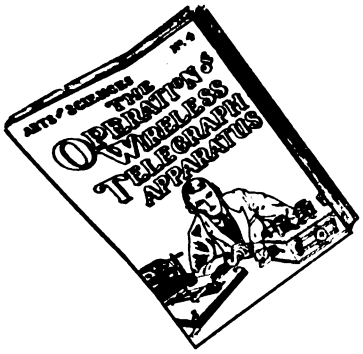
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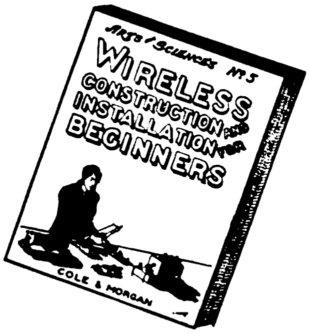
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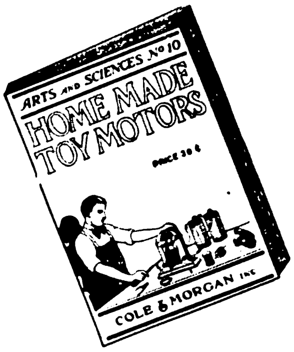

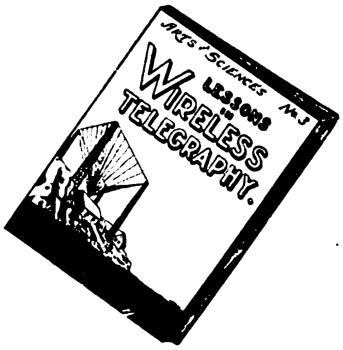

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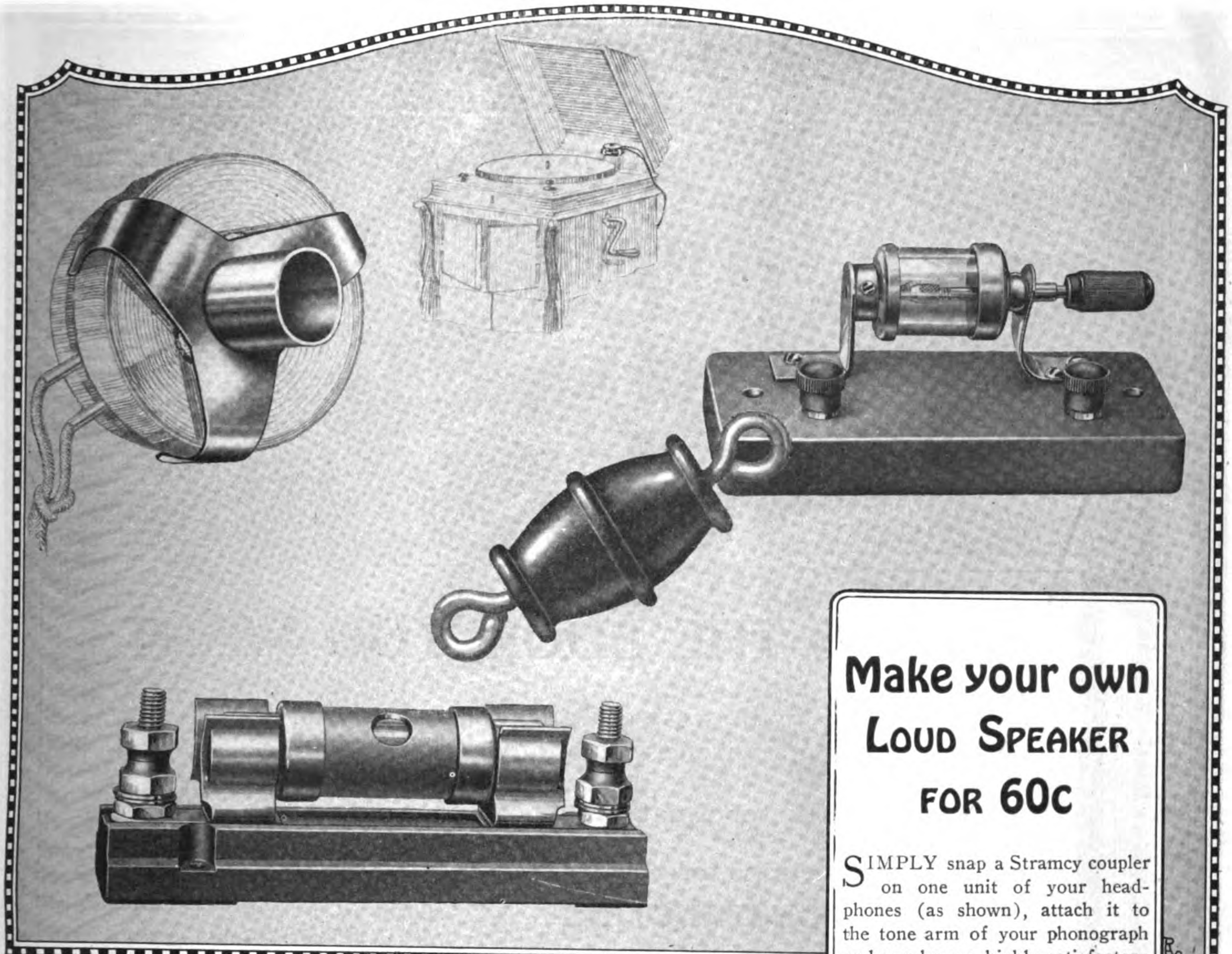

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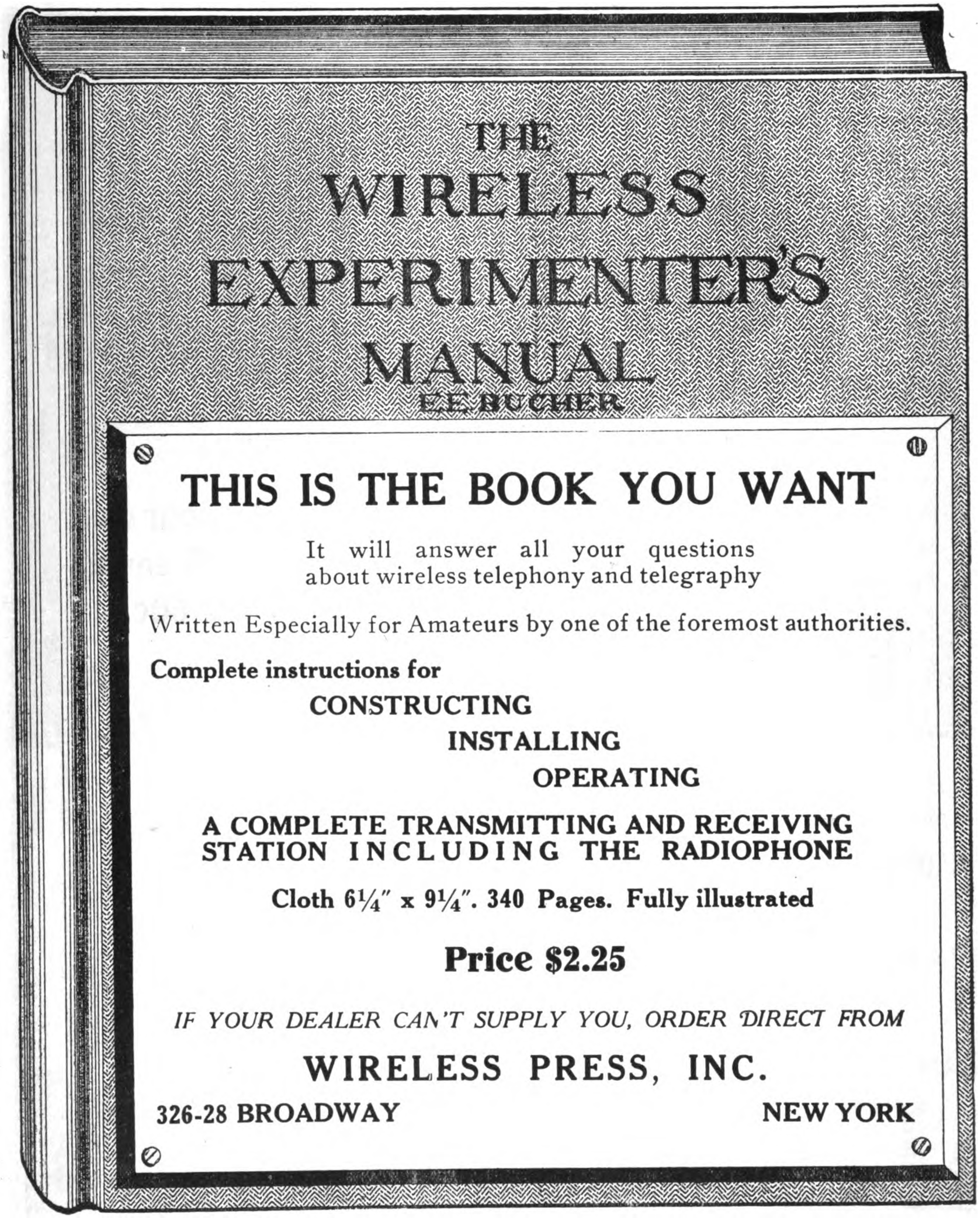

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LAWSAM

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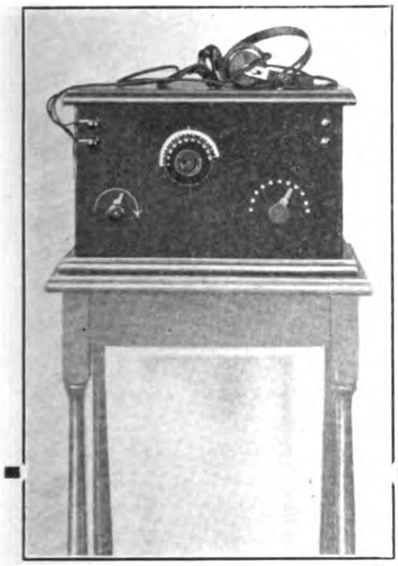

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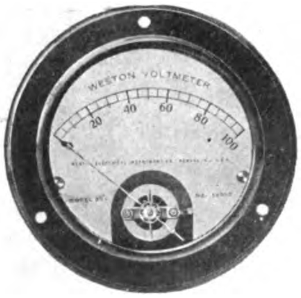
In the very near future of radio, the filament voltmeter will be regarded as absolutely indispensable.

Will you follow the wise practice of voltmeter filament control NOW, or will you wait until bitter experience convinces you of your error?



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Our Circular "J" describes in detail Weston Filament Voltmeters and other important instruments invaluable to owners of up-to-date receiving and transmitting sets. Send for a copy without delay, if your dealer cannot supply you.

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Radio Department

Weston Electrical Instrument Company
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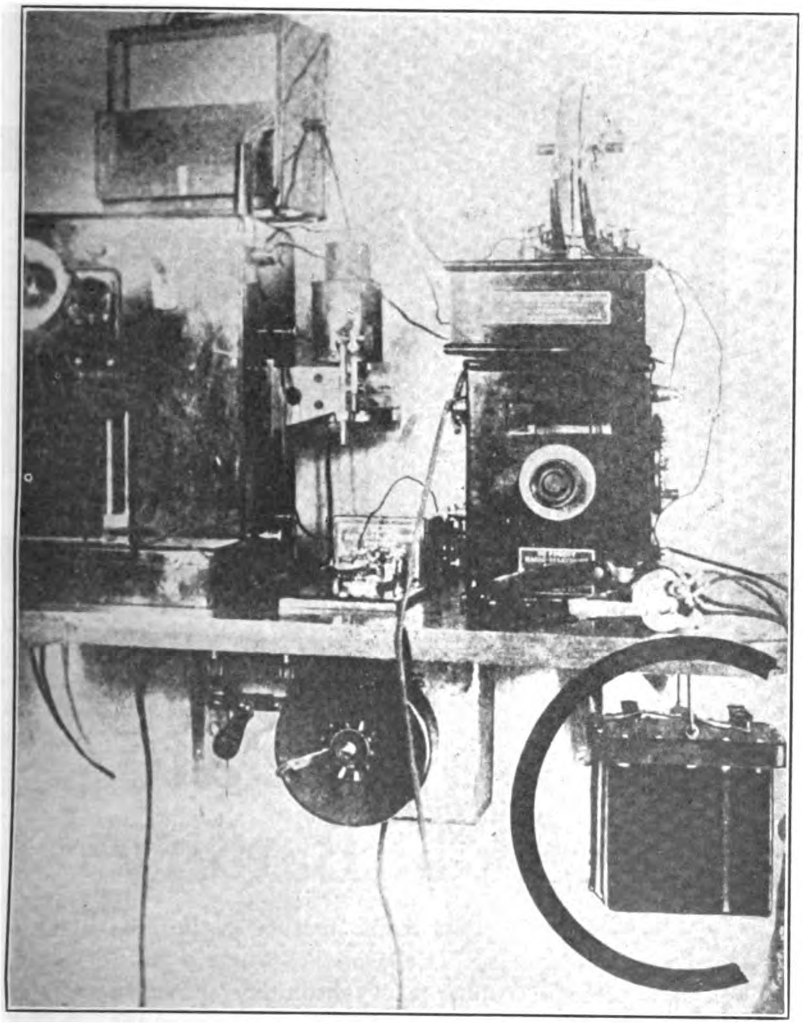

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First Set of

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← **BATTERY**

is the sole source of current.

Witherbee A Batteries are designed and built to meet the particular conditions prevailing in Radio CW Service.

They are constructed with extra heavy plates suited for slow discharge work thus insuring against voltage variations. Extra thick, specially treated separators are used which prevent internal discharge.

The entire construction is such that Witherbee Batteries may undergo continuous cycles of complete discharge and in addition may stand idle for long periods—without being harmed. The strong, clean Witherbee hard rubber case is the ideal enclosure for radio service. These cases have been a specialty of the *Witherbee* organization for nineteen years for use in the home or in the office where acid leaks would be fatally destructive. These cases have soft rubber bottom rests making them safe, clean and insuring perfect insulation.

"Built Right Since 1903" is the Witherbee slogan—and specifically applies to *Witherbee* Radio A Batteries.

For further information for the trade write:

WITHERBEE STORAGE BATTERY CO., Inc.
643-655 West 43rd Street
NEW YORK CITY, N. Y.

Builders of batteries since 1908 for automotive starting, lighting, ignition, etc.

This special Radio Battery has all the Willard Threaded Rubber Battery features that are applicable to Radio work —plus many new ones *found only in this battery.*

Bring Your Set Up-to-Date with this All-Rubber Radio Battery

It's just as important in receiving, to have a good battery as to have a reliable and efficient set.

The Willard All-Rubber Radio Battery was designed and is being used especially for radio work. It gives you the same reliability in wireless work as the starting and lighting battery has always given in motor cars. These batteries are available at a considerable less cost than the motor car battery.

Willard Radio Batteries are made with the same care, and have the same Threaded Rubber Insulation as the larger batteries.

An important Radio feature is the All-Rubber Case. Cells and case are a solid piece of rubber that absolutely prevents leakage from cell to cell or to the ground, thus doing away with one of the most troublesome sources of noise.

Threaded Rubber Insulation and case are both tested with 24,000 volt wireless transformers before assembly. Freedom from leakage is thus assured.

For details about the Radio Battery, go to the nearest Willard Battery Station, or write us direct.

WILLARD STORAGE BATTERY CO., Cleveland, Ohio

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Willard THREADED RUBBER BATTERY

New York's Amateur Show

The Most Spectacular, Mystifying and Gripping Convention and Exhibition which New York Has Ever Witnessed

IN 1492 Admiral Columbus discovered America and in 1922 General Public discovered radio. There's no doubt about it. Radio has been discovered, and the whole world has come to see and feast upon its thousand and one interesting and delightful features. The awakening of the lethargic giant, public interest, while really long overdue, has been so sudden and so complete as to carry everything along with it in its eager search for more, and still more, information.

As recently as a year ago, radio was practically an unknown quantity to the average person. This was very vividly demonstrated by an inquiry from a well-known business man during the convention and exhibition of the Executive Radio Council last year. This man telephoned to the Pennsylvania Hotel and asked if the exhibition would be held on that particular day, as it was raining. He had heard something about "catching" radio signals and had assumed that it was necessary to go up on the roof with some sort of a device, such as a crab net, and catch the signals as they came along.

The attitude of that man was the attitude of the multitude. Radio? Oh, yes, all the little schoolboys played at radio, just as they played checkers or tiddle-de-winks, but there wasn't anything in it for the grownups. Consequently when the 1921 Convention and Exhibition was held, General Public wasn't even interested to the extent of even investigating the possibilities of radio, and the attendance at the affair was confined principally to the members of the Order of Hard Boiled Hams.

But, oh, what a difference a few months have made.

There was no such ignorance this year during the second annual affair, which was held March 7 to 11, at the Pennsylvania Hotel, New York. No, Sir. This year, *this* year, was different, vastly different. Every man, woman and child of the 33,801 who attended the show, knew—get that—KNEW something about radio. They may not have known the difference between high and low frequency crystals, but they did know that it was necessary to have an aerial, a ground, a tuner and a pair of phones, and that when you turned a knob on the "box" to a certain place the result was—music, entertainment and education!

Miss Gladys Wyville singing "Kiss Me By Wireless," a song composed especially for the radio show

And so it has come to pass that radio has been discovered, has been acclaimed the greatest, most interesting, most fascinating of all forms of education and entertainment, and the news is rapidly spreading around the world. "Radio, on this particular day, thy name is legion."

Without question the Show was the most spectacular, mystifying, and gripping exhibition which New York has ever witnessed. The entire metropolitan area, from all appearances, was radio mad. The exhibition halls were packed with visitors from the first moment of opening, while during certain hours long lines in formation awaited with great patience entrance into the land of marvels. That their patience was well repaid was more than evidenced by the great interest displayed on every hand.

Owing to the heavy demand for space by exhibitors this year, it was necessary to use both the Roof Garden and the Butterfly Room for exhibits, and when the show was formally opened on the night of the 7th, sixty-five exhibits had been installed, every available square foot of space had been allotted, and there were still about a dozen applicants who could not be accommodated. Many of the exhibitors had based their printed matter supply on the attendance of last year, and the result was a flood of S O S telegrams to the home offices of the the exhibitors for more salesmen and more printed matter. More than one exhibitor moved packages, boxes and bundles from out-of-town points in specially chartered Pullman berths on limited trains in an attempt to get adequate supplies to the firing line in time.

A half hour after the doors opened, J. O. Smith, the Chairman of the Council, wedged his way to the band stand and and formally opened the affair with a few words of welcome to the visitors, the exhibitors and the representatives of the amateur fraternity who packed the floor of the Roof Garden. Comparing the enormous crowd of that evening with the small crowd which attended the opening a year previously, Mr. Smith said that if interest kept on increasing during the next year as it had during the past one, it would probably be necessary for the Council to hold next year's affair in Central Park.

It was necessary to adopt heroic measures in order to clear a space on the Roof Garden floor so that E. F. Glavin could operate his radio controlled vehicle. It took a lot of hard work on the part of a dozen huskies to get the crowd back, but when this had been accomplished Mr. Glavin entertained and mystified the large crowd with his radio controlled torpedo on wheels, familiarly known as the "Wireless Pup." As was the case last year, the torpedo proved to be one of the most interesting features of the exhibition and demonstrations during the following afternoons and evenings created great interest and enthusiasm among the thousands of spectators who watched the demonstrations. Owing to the great crowds it was necessary to put blinders on the "Pup" to relieve it of stage fright.

The receiving equipment used by Paul F. Godley at Ardrossan, Scotland, caused more than one radio microbe to find an early lodging in the gaping mouths of the crowd. The tubes displayed with the set were the identical ones which actually recorded the signals of American amateurs during the tests. Mr. Godley operated the set during the afternoons and evenings and clearly demonstrated the great amplification possible with it. Using a small loop he succeeded in making audible the music, speech and signals from several radiophone stations. The broadcasting was heard all over the Roof Garden, by use of a loud-speaker horn. The degree of amplification obtained with this set was positively amazing even to the experienced operators, and as one visitor remarked: "In radio frequency lies the solution of the antenna problem for the New York City cave dweller."

On Wednesday afternoon engineers of several of the exhibiting manufacturers radiated considerable verbal energy of various frequencies in giving talks on new equipment, which proved to be of great interest to the hundreds who filled the large ballroom of the hotel. In the evening over 1,200 persons listened to W. C. White, of the General Electric Company, who read a paper on "Vacuum Tubes and Their Operation." Mr. White is one of the foremost authorities of the country on vacuum tubes, and, in addition, possesses the happy faculty of being able to cover a technical subject in a non-technical way, a very desirable quality in view of the large number of non-technical enthusiasts who attended.

Paul F. Godley followed Mr. White, and got a rousing reception. He described in detail how the recording of American amateur station signals in Scotland was accomplished in spite of the wetness of the country, and in addition called attention to the large number of C. W. stations heard, as compared to the number of spark stations, and expressed the hope that all amateurs would use C. W. in the future and so avoid disturbance of other radio communication, which has in the past been attributed to the broad waves in amateur "stone crusher" operation.

On the afternoon of Thursday, March 9, the Roof Garden and Butterfly Room were crowded to capacity by the unprecedented, but not wholly unexpected crowds which had attended the affair from the beginning, among the crowd being a large number of correspondents, representing newspapers located all over the world. During each evening, in fact, the crowds had become so great as to fill the Roof Garden to capacity and it was necessary to close the doors on hundreds who were attempting to get in. The Committee did this regretfully, as it was realized that many enthusiasts had probably traveled long distances to attend the exhibition, but the action was absolutely necessary as a matter of convenience and safety to the crowds already in the building, who wouldn't or couldn't get their fill of the exhibited wonders and take heed of the EXIT signs.

The preliminaries of the open-to-all code speed contest were held during the evening of the 9th, and when ten men qualified at 40 words per minute, with perfect copy, it was evident that the final on the following night was to be a real battle between the code speed experts of the eastern part of the country.

During the afternoon of the 10th, E. D. Glavin and P. F. Godley again entertained the crowd with demonstrations of their equipment and in the evening the finals of the Code Speed Contest were run. Radio Inspector E. A. Beane was judge of the contest. A vacuum tube, oscillating at audio frequency was used, instead of a buzzer and the transmission was done by means of a motor-driven Wheatstone transmitter. The tape was punched on the spot, the operator of the machine being in full view of the contestants. Straight copy from a newspaper was used. There were first, second and third prizes; the first being a silver cup, the second a gold watch fob and the third a silver fob.

Excitement ran high and it is even understood but not verified that several friendly arguments took place over the merits of the respective contestants.

The contest was very skillfully handled by Mr. Beane and resulted as follows:

First prize: José M. Seron, Radio Corporation of America, speed for two minutes, 49½ words per minute, with three errors.

Second prize: B. G. Seutter, New York Times (Last year's winner with 48.6 words per minute). Speed 49½ words per minute, four errors.

Third prize; George C. Otten, Radio Corporation of America. Speed 49½ words per minute, five errors.

The accomplishment of Mr. Seron breaks all known records for code speed reception, and 49½ words per minute, perfect copy, is therefore, the new world's record for all future aspirants to the honor to shoot at. The accomplishment of Mr. Seron is really a remarkable one, in view of the fact that he came to New York from Chili less than one year ago knowing very little of the English language!

On Saturday, the 11th, the last day of the show, the crowd awaiting entrance had become so great at 12 o'clock that it was decided to open the show an hour ahead of time to relieve congestion in the lobby and halls of the hotel.

The Code Speed Contest for Women was held at 3 p. m., with Radio Inspector E. A. Beane acting as judge. There were ten entrants. A silver cup, suitably engraved, was awarded the winner for copying the greatest number of words per minute, with the least number of errors, hand copy. The contest was won by Miss Ruby Yelland of the Hudson street, New York, office of the Radio Corporation of America. Speed 30½ words per minute, perfect copy. Miss Marion C. Chicken, a student of the Radio Institute of America, was second with 30½ words. The judges reported, however, that Miss Chicken made four scratches in her copy. Miss Marianne C. Brown was third, with 30½ words, nine errors.

The jamming contest followed. This contest was open only to bona-fide amateurs not employed in the operating department of any radio, telegraph or cable company. It was not open to anyone who had entered the Code Speed Contest of the night before.

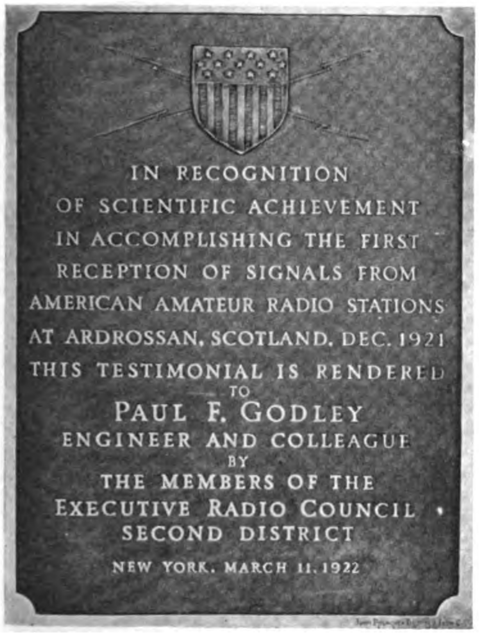
Signals were transmitted the same as in the Code Speed Contest and while there was no direct interference with the matter being transmitted, other signals from buzzers of different pitch were transmitted on the circuit, to simulate conditions in congested radio territory. The entrant turning in the most complete copy at the end of the contest was declared the winner. The prize was a silver cup, suitably engraved.

It was anticipated that some active amateur of the Second District would win the contest, for anyone who can successfully work night after night through the jamming in the Second District needn't worry over an ordinary jamming contest. Thomas A. Jobs, of Summit, N. J., a well-known amateur, call letters 2AAF, turned in the most complete copy and won the contest.

The convention and exhibition came to an end at midnight on Saturday at the close of the second annual dinner, the detailed story of which appears on another page.

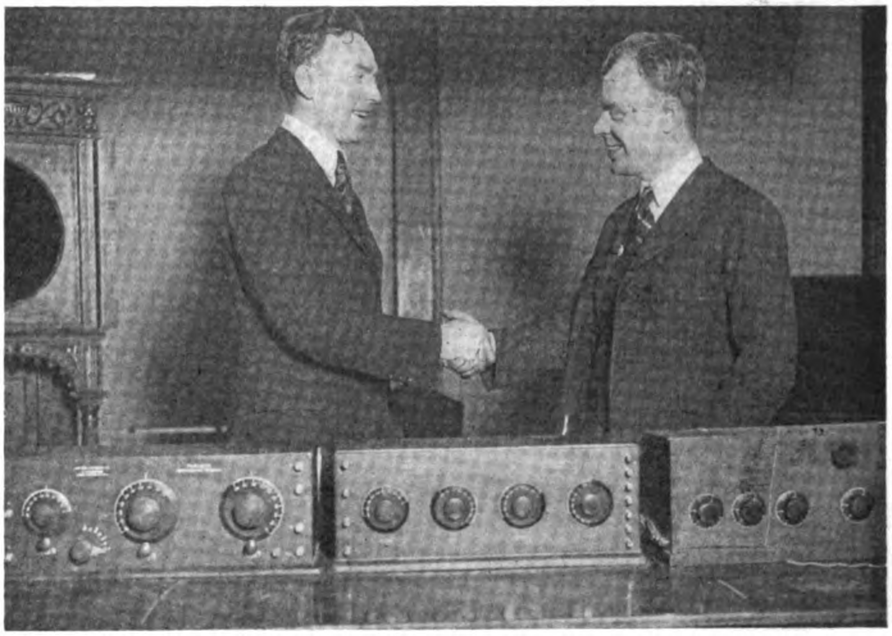
The outstanding feature of this year's affair, was the unusual crowd and the fact that a large part of it knew nothing about radio, but had been attracted, evidently by the great amount of space devoted to radio by the daily papers, and had come as a result, to find out what it was all about. Some of them found out, but many of them didn't, for the simple reason that visitors outnumbered exhibitors by about 100 to 1 at every ses-

The Convention Committee of the Executive Radio Council which made the affair a record-breaking success. In the front row, seated, are: F. L. MacLaughlin, W. J. Howell, C. E. Huffman, R. H. McMann, J. O. Smith, chairman; A. F. Clough, R. Hertzberg and C. E. Trube. In the rear row, standing are: W. A. Remy, B. B. Jackson, J. J. Kulik, F. B. Ostman, E. A. Kilroy, J. B. Ferguson, Leroy Watkins and Matthias Thury



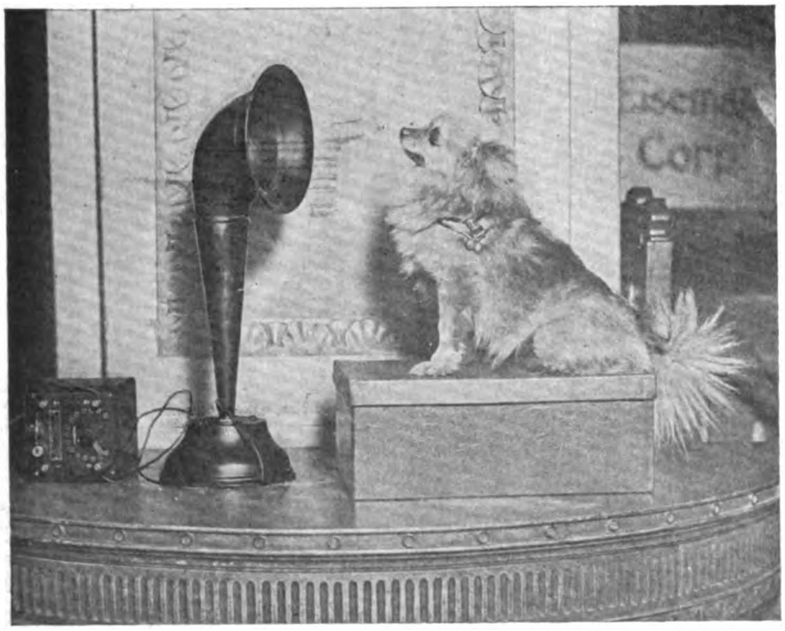
IN RECOGNITION
OF SCIENTIFIC ACHIEVEMENT
IN ACCOMPLISHING THE FIRST
RECEPTION OF SIGNALS FROM
AMERICAN AMATEUR RADIO STATIONS
AT ARDROSSAN, SCOTLAND, DEC. 1921
THIS TESTIMONIAL IS RENDERED
TO
PAUL F. GODLEY
ENGINEER AND COLLEAGUE
BY
THE MEMBERS OF THE
EXECUTIVE RADIO COUNCIL
SECOND DISTRICT
NEW YORK, MARCH 11, 1922

Bronze tablet presented to Paul F. Godley by the Executive Radio Council



Paul F. Godley of Ardrossan fame and Jack Binns of S. S. Republic fame met for the first time at the show

Typical view of the crowd, a condition that prevailed during the entire week. Every walk and condition of life was represented and they came from all parts of the United States and Canada sion of the exhibiton. Under the circumstances it was impossible to answer the questions on the tongues of thousands of visitors, and the result would have been the same had there been unlimited space available.



A new version of "His Master's Voice." The bushy appearance of the tail is due to the continual wagging of it by his Dogship while the picture was being made indicating that the music coming from the horn was pleasing

A comparison of attendance figures of this and last year's affair is an indication of the great growth of interest in radio. The detailed figures are as follows:

	This year	Last year
First Day	3,033	916
Second Day	8,661	1,015
Third Day	7,701	1,520
Fourth Day	7,364	1,714
Fifth Day	7,042	
	33,801	5,165

The Executive Radio Council, Second District, was formed for the purpose of mutual benefit and general improvement in amateur operating conditions. During its existence the Council has accomplished a great deal, has assisted a great many amateurs in the way of a "big brother," and has always promoted the advancement of the science of amateur radio communication whenever possible. The Clubs which compose the Council are the leading ones of the Second Radio Inspection District, which includes Southern New York, Long Island, Staten Island and Northern New Jersey. It is composed of two delegates from each of the following clubs:

Radio Club of America, New York City.
Armour Villa Radio Club, Bronxville, N. Y.
Bloomfield Radio Club, Bloomfield, N. J.
Radio Club of the Bronx, Bronx, New York City.
Radio Association of Greater New York, New York City.
Hill City Radio Club, Summit, N. J.
The Radio Club, Irvington, N. J.
Radio Club of Long Island, Long Island City, N. Y.
North Jersey Radio Association, Newark, N. J.
Radio Traffic Association, Brooklyn, N. Y.
Ridgewood Radio Club, Ridgewood, N. J.
Rutherford Radio Club, Rutherford, N. J.
Stuyvesant Radio Club, Bronx, New York City.
Talo Club, New York City.
Westfield Radio Association, Westfield, N. J.
Y. M. C. A. Radio Club, New York City.
Yonkers Radio Club, Yonkers, N. Y.
White Plains High School Radio Club, White Plains, N. Y.
Hackensack Radio Club, Hackensack, N. J.
Nutley Radio Club, Nutley, N. J.
Radio Club of Hudson County, Hoboken, N. J.
Nassau Radio League, Freeport, L. I., N. Y.
Passaic High School Radio, Passaic, N. J.
Hudson Radio Club, New York City.
Chelsea Radio Association, New York City.

The officers of the Council are: J. O. Smith, Chairman; R. H. McMann, Vice-Chairman; M. Blum, Recording Secretary; C. E. Trube, Treasurer; C. B. Hobson, Corresponding Secretary; C. J. Goette, Traffic Supervisor.

The following is a list of the exhibitors at this, the second annual convention and exhibition:

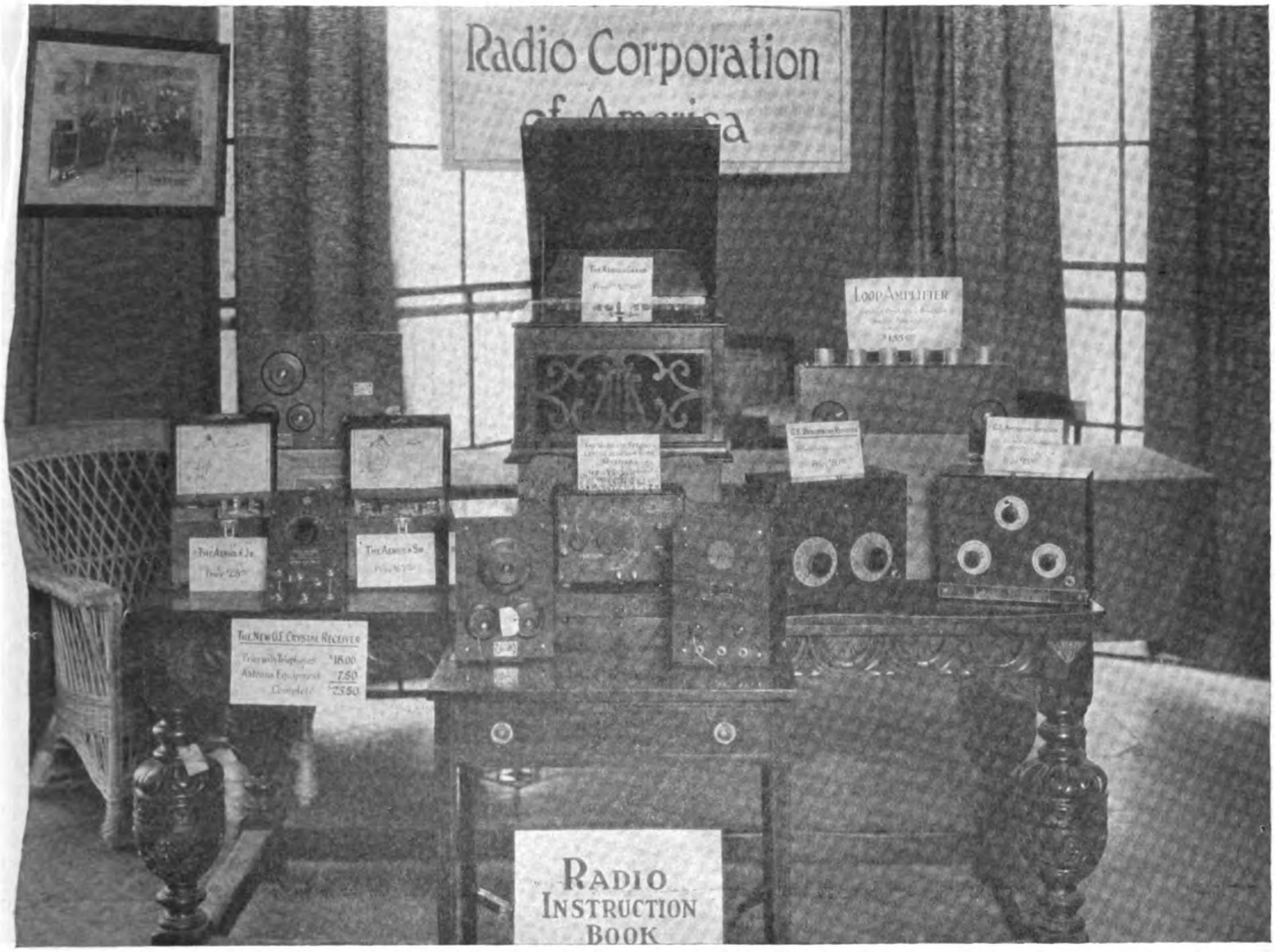
BUTTERFLY ROOM

American Eveready Works
F. Andrea & Company
L. S. Brach Manufacturing Company
Connecticut Telephone & Electric Company
Chicago Radio Laboratory
Diamond State Fibre Company
Electrose Manufacturing Company
Experimenter Publishing Company
Formica Insulation Company
General Apparatus Company
Hudson Radio Club
International Radio Exchange
Jewett Manufacturing Corporation
Lexington Radio & Electric Corporation
Loyd Wireless Telephone Corporation
Novo Manufacturing Company
Westinghouse Union Battery Company

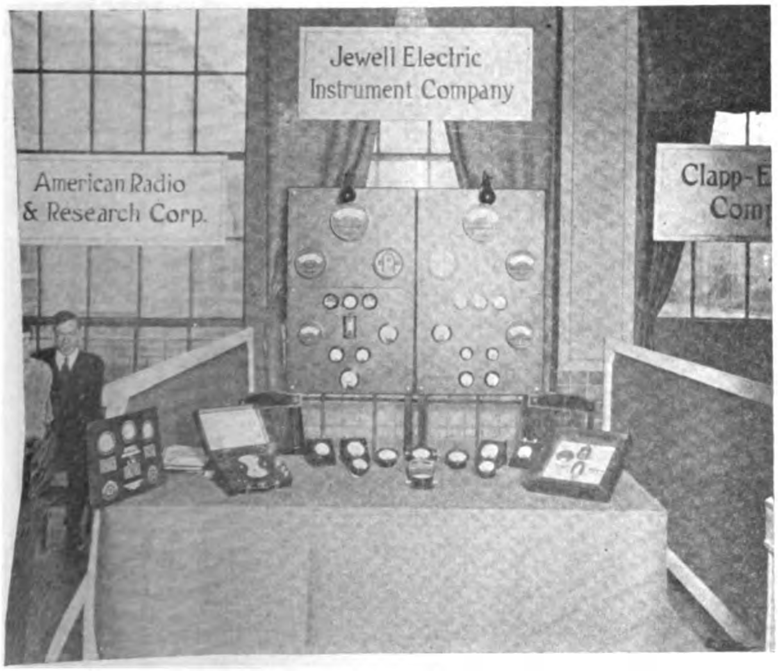
ROOF GARDEN

Acme Apparatus Company
Adams-Morgan Company
American Electro-Technical Appliance Company
American Radio Relay League
American Radio & Research Corporation
Clapp-Eastham Company
Continental Radio & Electric Corporation
R. U. Clark, 3rd
Copper Clad Steel Company
DeForest Radio Telephone & Telegraph Company
Dreyfuss Sales Corporation
P. M. Dreyfuss Co., Inc.
George Fredericks
Freed-Eisemann Radio Corporation
Federal Telephone & Telegraph Company
The Globe
General Radio Company
A. H. Grebe & Company
Jewell Electrical Instrument Company
Keystone Wire Company
The Evening Mail
Manhattan Electrical Supply Company
Marko Storage Battery Company
The Modulator
William J. Murdock Company
Mills Radio & Electric Company
Pacent Electric Company, Inc.
Prest-O-Lite
Radio Audion Company
Radio Club of America
Radio Corporation of America
Radio Distributing Company
Radio Service & Manufacturing Company
Radio Topics
H. B. Shontz & Company, Inc.
Ship Owners Radio Service, Inc.
Shotton Radio & Manufacturing Company
C. D. Tuska Company
Wireless Press
Weston Electrical Instrument Company
Willard Storage Battery Company
East Side Y. M. C. A.
United States Army Signal Corps
United States Department of Commerce, Radio Service.

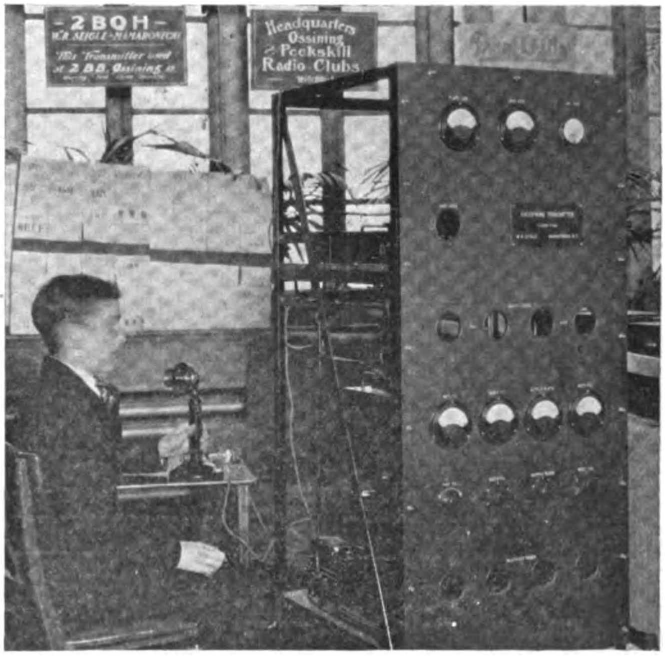
The Committee in charge of this year's affair was as follows: J. O. Smith, Chairman; R. H. McMann, Vice-Chairman; A. F. Clough, John Di Blasi, F. B. Ostman, Leroy Watkins, E. A. Kilroy, W. J. Howell, R. Hertzberg, J. B. Ferguson, C. E. Trube, C. B. Hobson, B. B. Jackson, F. L. MacLaughlin, Matthias Thury, J. J. Kulik, M. Blum, C. E. Huffman.



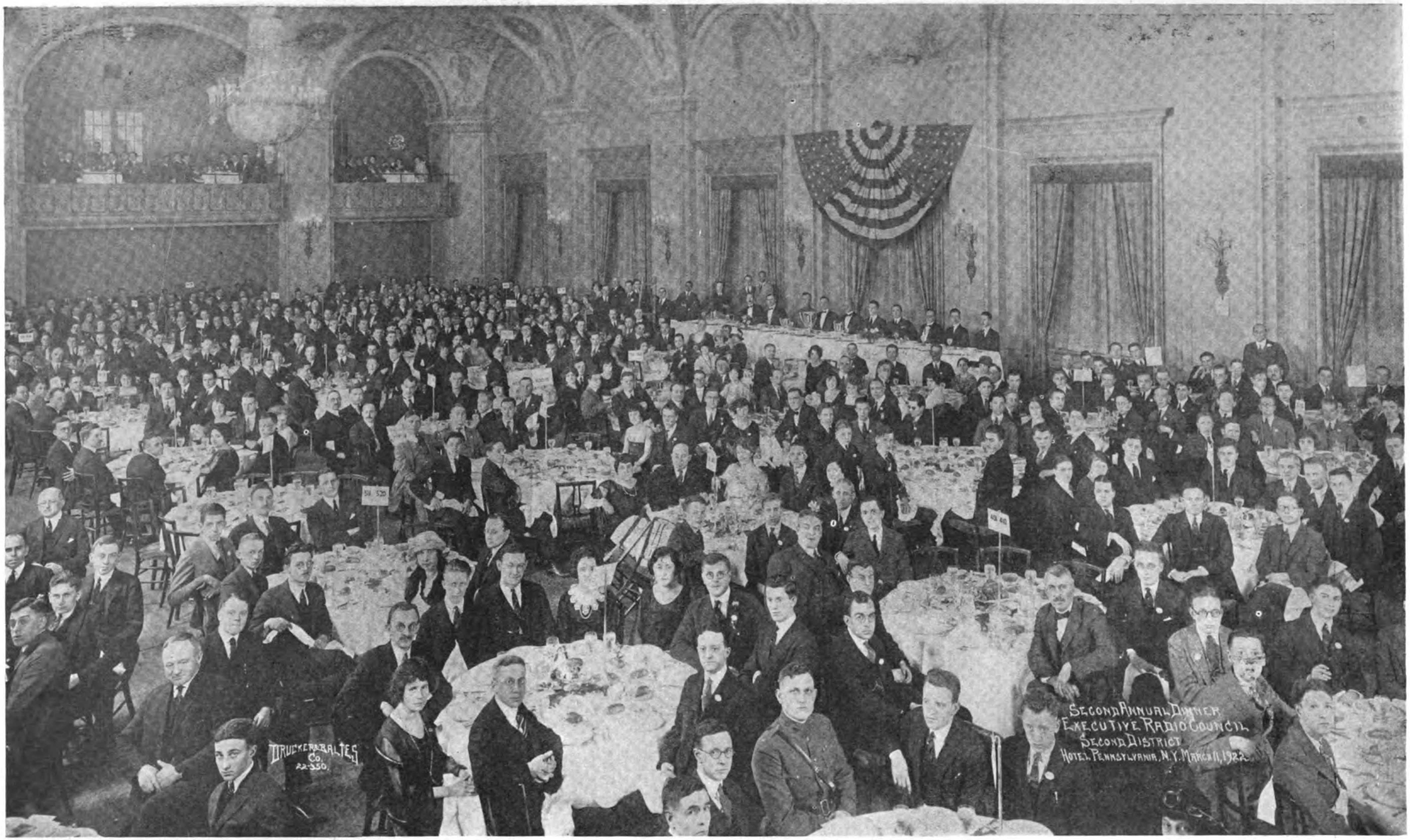
The exhibit of the Radio Corporation of America was filled to the limit at every session. The new outfits for the reception of broadcasting, including the Aeriola Grand, the Aeriola Senior, the new General Electric receiving units were subjects of great interest to the visitors


Jewell Electric Instrument Company
American Radio & Research Corp.
Clapp-E
Com

The Jewell Electrical Instrument Company exhibited an extensive line of AC and DC meters. for every conceivable purpose and the exhibit was a Mecca for the operators, or intending operators, of C. W. transmitting sets



The exhibit of the Ossining and Peekskill Radio Clubs, which contained a panel radiophone set belonging to W. R. Seigle, 2BQH, was an excellent indication of the skill of the amateurs in assembling sets of this type. The set was in operation during the entire week


SECOND ANNUAL DINNER
EXECUTIVE RADIO COUNCIL
SECOND DISTRICT
HOTEL PENNSYLVANIA, N.Y. MARCH 11, 1922.
DRUCKER & BALTES CO. 22-350.

The Second Annual Dinner was extremely novel in many respects and broke all precedents for attendance. It was a scene of wild enthusiasm on the part of the diners. Practically everybody in the country engaged or interested in radio was there, and for the first time many artists who had sung to thousands of listeners via the radiophone were present and entertained a gathering of radio enthusiasts in person. Speakers table, left to right: John V. L. Hogan, Consulting Engineer, Westinghouse Electric and Manufacturing Company; Dr. Alfred N. Goldsmith, Secretary Institute of Radio Engineers, Research Engineer, Radio Corporation of America; Major Roy H. Coles, U.S.A., Chief Signal Officer, Second Corps Area; Paul F. Godley, Radio Engineer, of Ardrossan fame; Chairman J. O. Smith; Henry L. Bogardus, Assistant Radio Inspector, Second District; Lieut.-Commander D. C. Patterson, U. S. N., District Communication Superintendent; J. Andrew White, Editor, The Wireless Age; K. B. Warner, Editor, Q.S.T.; F. H. Schnell, Traffic Mgr., A.R.R.L.

The Banquet

ONE thousand and twenty-five persons crowded into the large ballroom of the Pennsylvania Hotel to attend the banquet which wound up the week's activities. The diners were in Saturday night festive mood and typically a radio gathering in spirit. Dot and dash messages and greetings were whistled and buzzed from table to table during the serving of the course dinner, including code applause for the entertainers who appeared in person to duplicate some of the features which had been broadcasted from WJZ and WDY. Among the prominent entertainers who sang familiar songs were Virginia Burt, the Stuart Sisters, Albert Wiederhold, Jack Sheehan, Louis James, Nat Saunders, Dave Wohlman, Raymond M. Shottler and Louis Breau. A novelty was also introduced in a dance — announced to be impossible for radio broadcasting — executed by Maxie and George, the sensational colored dancers who were then playing at the Winter Garden and the Club Maurice. Then everybody sang old-time favorite songs under the leadership of Nat Saunders, well-known composer, and responded with zestful "hello's!" as the music swung over to the first radio song, "Kiss Me by Wireless." For an hour or more, the thousand diners had a gloriously informal good time, but finally subsided into attentiveness as the scheduled after dinner speeches began.

The introductory remarks were made by J. O. Smith, presiding, as "Well, fellows, once more, we put it over!" he announced, adding that in view of the unprecedented crowds, it was unfortunate that the Pennsylvania Hotel was built of steel and stone, and not of rubber. The new situation in radio, he explained, was due to the great development of radio broadcasting "bringing with it multitudes of new converts to the Order of Boiled Hams. And to all of you who have become converts to the cause of radio broadcasting," he added, "we older Hams extend you a welcome, and we wish you the great joy that only faithful pursuit of this greatest of all hobbies, pastimes, educational pursuits (or whatever you choose to call it) can give you."

Mr. Smith noted that radio at present is in a state of evolution, observing: "What its future will be no man can say. It is practically certain, however, that there will always be a place in radio for the amateur and for amateur operation; and when the emergency comes, no matter what that emergency may be, the amateur will be found ready and eager to do his bit as he always has in the past.

"The pages of history are filled with the deeds of radio amateurs which cannot be ignored or overlooked. From the ranks of amateurs must come the men of the future to carry on the science of radio to its greatest usefulness."

The individual members of the Committee of the Executive Radio Council were then introduced as the men who made this year's affair the greatest success in the history of amateur radio.

The diners were next called upon to disclose themselves by geographical designation, representatives arising from all districts except the sixth and seventh. Even Canada responded in the person of a single representative.

Mr. Smith then introduced the first speaker, John V. L. Hogan, Consulting Engineer of the Westinghouse Electric and Manufacturing Company, who selected as a topic the apparent difference of opinion which seemed to be growing up between amateurs generally and the manufacturing companies. "It appeared to me," said Mr. Hogan, "that within the last six months things had been getting worse and worse. I have heard three distinct criticisms from amateurs directed toward the manufacturing companies. The first one was, that the manufacturing companies don't want any amateur extension; that the amateurs interfere with broadcasting, and that they don't want to have any more amateur transmitters around the country. The second criticism was, that amateur transmitters must not be used for broadcasting. Manufacturing companies, according to this criticism, were behind the recent regulation of the Department of Commerce, which restricted broadcasting on two hundred meter wavelength. The third criticism was, that the manufacturing companies were attempting to restrict the sale of apparatus; that that was why you could not buy apparatus."

Mr. Hogan said he didn't like the sound of any one of these three criticisms, so he put the three questions to an executive of the Westinghouse Company, asking: "Does the Westinghouse Company oppose the extension of amateur activities?"

The answer was: "No. We hope that the new regulations which will grow out of the Washington Conference will give the amateur, instead of the single wavelength of 200 meters, which he now has, a band of at least 100 meters for his purposes. The only thing we think the amateur should do is to stay within his band, as the other stations will be required to stay within their own wavelength bands."

On the criticism — that manufacturing companies were behind the ruling that no amateur station should be used for broadcasting, the answer was: "No, we did not attempt that; as we understand it, the regulation was carried forward at the request of amateurs who were endeavoring to do long distance work on the wavelengths available to them, and who were interfered with in that work by broadcasting on the amateur wavelengths. When the additional wavelengths are opened up to amateur communication, there is no reason why amateur broadcasting ought not only to be permitted, but encouraged."

On the third point, Mr. Hogan's inquiry was: "Are you restricting the sale of apparatus? Are you attempting to keep the stuff off the market, or are you doing all you can to make it ready?" He was told, he said, that everything possible was being done. "The demand for apparatus has grown so much faster than the possibilities of manufacture that all companies building radio stuff have, as you know, been up against it to get it out," he observed. "Now, they are spending large amounts of money in tooling up for the manufacture of materials in larger and larger quantities, and I have been able to find nothing which would indicate any desire to restrict the sale of the best material available to amateurs and to everyone else."

When the applause had subsided, the Chairman introduced Lieutenant-Commander D. C. Patterson, District Communication Superintendent, Navy Department, who outlined the extent of the Navy's radio communication system and the Department's attitude toward the amateur.

"Before this recent conference in Washington was called," he said, "the Director asked for my views and recommendations. I was very pleased to be able to tell him that we suffered absolutely no interference from any amateurs of this district, nor from the commercial radio telephone broadcasting!

"I told him that your increased importance and activities of amateurs deserved special recognition in increased privileges and in increased wavelengths. I am glad to see that the Conference is granting those privileges and those extra wavelengths."

In closing, Commander Patterson called attention to the fact that our country while on the very threshold of world naval supremacy has foregone that naval supremacy in order to maintain the moral leadership of the world. "The actual disarmament was not the important thing," he stated. "It was the spirit back of this disarmament; but no one can promise you that war is over and you cannot be assured of that until there has been a spiritual rebirth throughout the world. Now, until that time comes, fellow radio men, I want to tell you that the Navy in another national emergency will need the amateur as it did before. I ask you not to let the fascination of radio telephone broadcasting and listening to music interfere with the vastly more, to us at least, business of code work. Keep at it!

"Let's all keep together and be ready if we should ever be called upon again."

At the conclusion of this speech the chairman called the attention of the diners to the high honor of having with them Major General George O. Squier, Chief Signal Officer of the United States Army, who was seated at one of the tables, in the midst of the amateurs. The diners applauded vigorously as General Squier arose and bowed.

Mr. Smith then found another celebrity, seated at a rear table, whom he introduced as "a man who has been in radio so long that when he started, there wasn't any amateur radio. Consequently, he has always been a commercial man — David Sarnoff, General Manager of the Radio Corporation of America."

Mr. Sarnoff made a brief complimentary address to the amateur fraternity, stating that to his mind there are a great many radio men of qualification and ability in the amateur world who might very properly be characterized as professional radio men, adding that in view of the accomplishments of these, he, as a professional man might say, "Pray make me an amateur." This observation brought forth laughter and applause.

"As General Manager of the Radio Corporation of America," said Mr. Sarnoff, "I can tell you officially that the policy of the Radio Corporation is to encourage in every possible way the activities of the amateur or experimenter or worker in the radio field, no matter what department he may be interested in.

"We believe there is enough opportunity in radio for everyone who is interested to have a chance to work, whether that be in the line of scientific experimentation, or whether that be in the field of merchandising — there is plenty for all of us. Radio to my mind is the biggest thing that has happened in the world in the last century, and any of you who are questioning your opportunities to be allowed by these large organizations to go forward with any program that has as its basis service and responsibility, can relieve your minds of such questions. You will have every opportunity that a responsible person deserves to do your part, whatever it may be in the radio world!"

Major Roy H. Coles was the next speaker, as representative of the many activities of the Signal Corps where they join the activities of amateur radio.

He stated that the adequacy and efficiency of communication systems are of the utmost importance to the Signal Corps, so that branch of the Service is sparing no efforts which resources and authority allow to keep in the forefront of the wonderful advance in radio.

"As to the supply of radio equipment and the development of new apparatus and its perfection, we feel that we can take care of the situation quite efficiently with a continuation of the hearty co-operation and assistance which has always been tendered us by the great commercial concerns of America," he explained, "but the personnel problem is one which we are not quite so well satisfied with. Equipment and apparatus can be supplied, but personnel is something that requires thought and spirit, and while we were with you from beginning to end in the pleasure and profit you amateurs derived from this great art, we ask you not to forget that in time of emergency, or war (which, please God, may never come!), that unless we put the communication business across, it is, good-night!

"So that all we ask you is to keep us in mind, co-operate with us, think of our troubles; we are trying to keep the old machine going, so that it will be ready if we ever do need it. We can't do it without the help of you amateurs.

"On our part, we are for you and with you. If there is anything that the Army has or that the Signal Corps has that you need and we can give you access to, we are not only willing to do it, but glad to do it."

The winners and successful contenders for the championship code speed contest, the contest for women only, and the jamming contest, were then introduced. Prominent amateurs of the Second District were next called upon, each one rising in response to his call letters.

Henry L. Bogardus, of the office of the Chief Radio Inspector of the Second District, was then introduced as the next speaker. He said:

"The average amateur looks upon the radio inspector as a fearsome individual who goes around with a pocket decremeter, and with one ear open for tales of wrongdoers. I wish to refute this theory. A large percentage of the radio inspectors and almost all of them, in fact, either are or were at one time amateurs themselves.

"I suppose that many of you are eagerly waiting news in detail of the conference in Washington. As some of you probably have noted, provision is made for amateur wavelengths of from 150 to 275 meters instead of setting the limit at 200 meters as at present required.

"This will provide a band of amateur wavelengths on which some very good results may be obtained. It must be borne in mind, however, that this band of wavelengths is not yet legally assigned and until such time as the necessary legislation is passed to amend the present law, the present 200-meter limit remains in force."

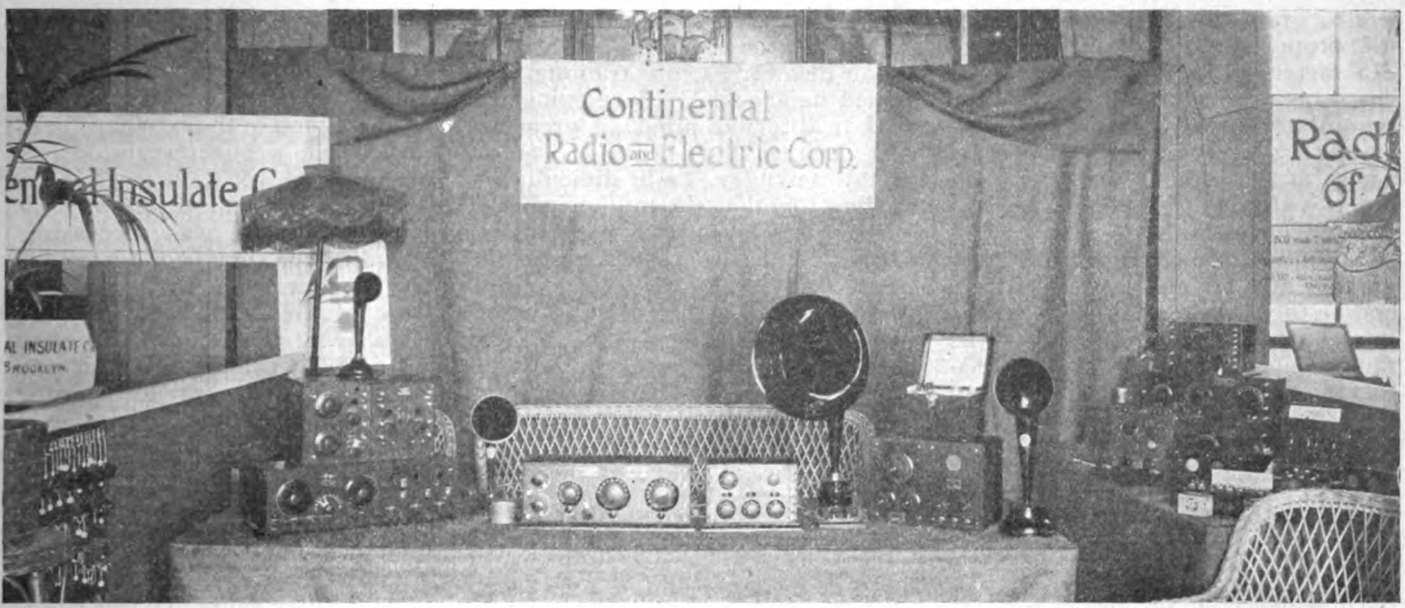
The address of Dr. Alfred N. Goldsmith, followed; he said in part:

"I had hoped very ardently that certain of my fellow-members of the Radio Telephone Commission, which recently met in Washington, would be present this evening to say to you in well-chosen and correct terms something about the work that was done down there.

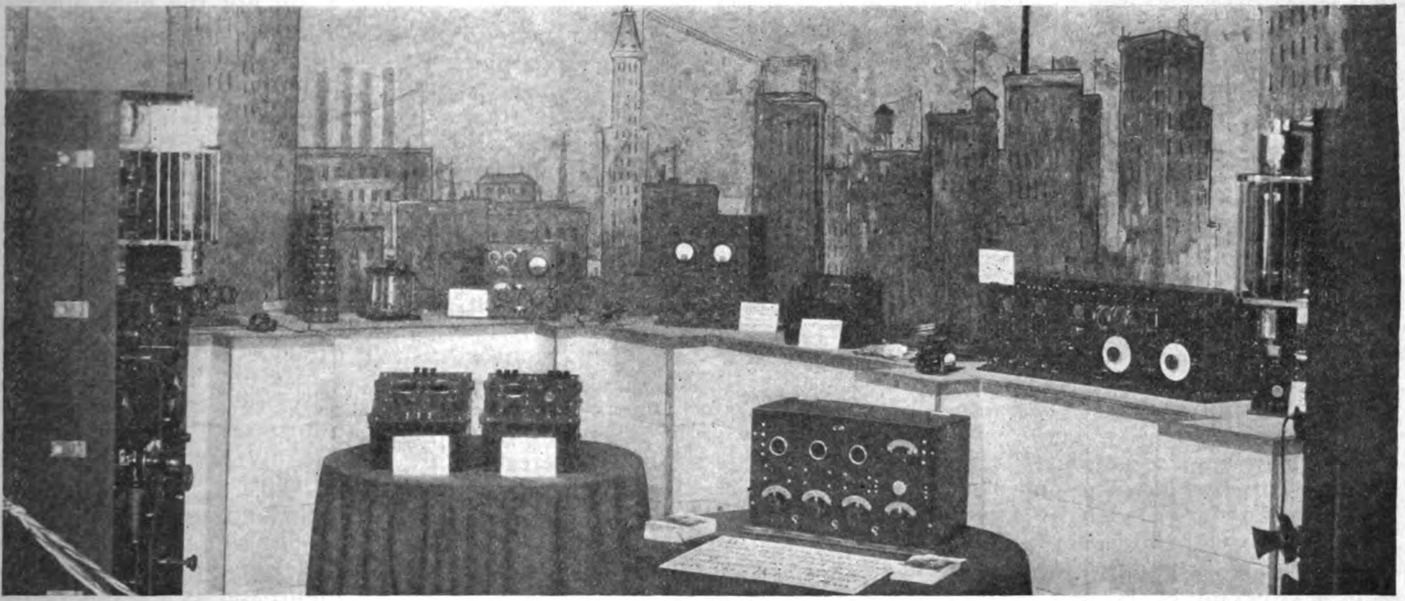
"The interesting and, to me, most significant feature of the entire meeting was the absolute unanimity on one proposition. There may have been disagreements or careful thought and consideration required for the placing of the many complicated services which modern radio demands, but when it came to the status of the amateur, there was no dispute, there was no question!

"I may say that the amateur therefore took up less of the time of the Commission than anybody else," he continued, "simply because the amateur had laid down a well-considered and perfectly reasonable program which would give him an opportunity to expand his activities along legitimate lines which would relieve the present congestion on amateur wavelengths and which would give him wider opportunity to study the field of radio, to establish long distance records, to broadcast and to do all those other interesting things which are so dear to the hearts of amateurs.

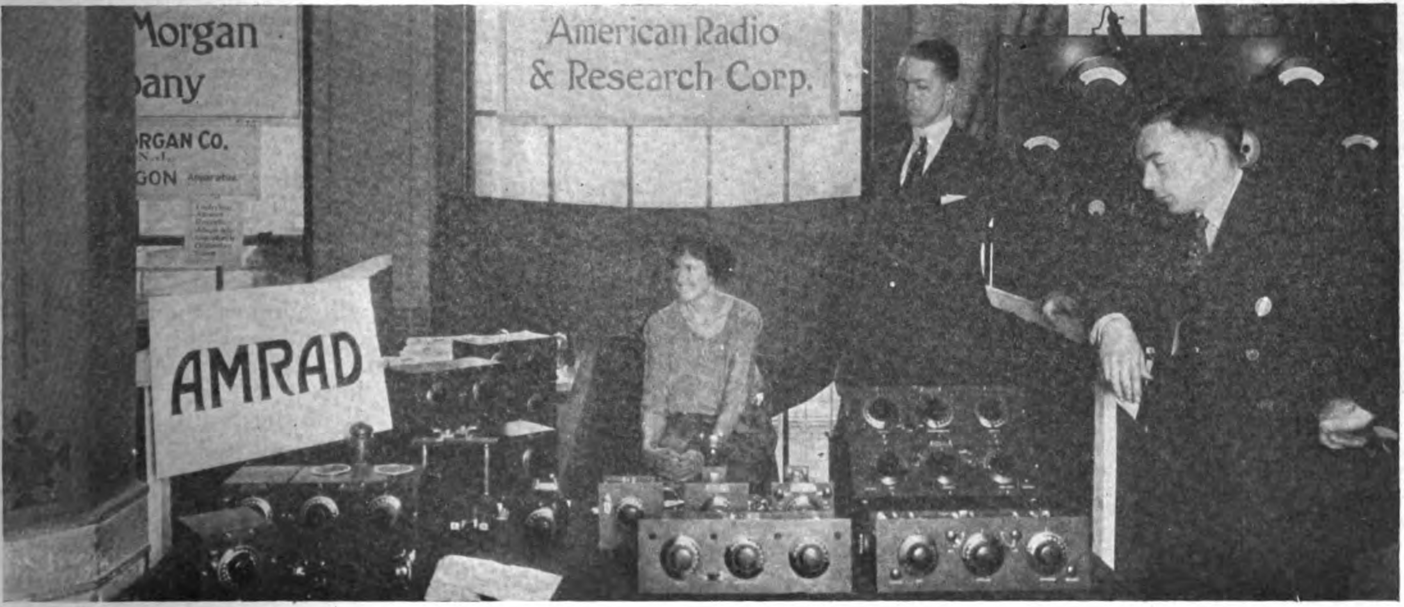
"Accordingly he received the wave-



The exhibit of the Continental Radio and Electric Corporation contained the only known samples not in captivity of certain types of equipment. According to John Grinan the visitors at the exhibit totalled 41,144 which, however, is slightly at variance with the total attendance figures of the show



The Radio City, of the DeForest Radio Telephone and Telegraph Company, was a most unusual and attractive exhibit, and was packed full of interested radioites during the whole run of the show



The many models of receiving equipment manufactured by the American Radio and Research Corporation, attracted a great deal of interest. Two or three units of Amrad equipment were in operation during the week length grant (or will receive under the proposed law) of from 150 to 275 meters; but this is not to be chaos, it is not to be used indiscriminately by any amateur at will on any wavelength within that zone. There is to be, as I understand it, order within that zone in that the shorter wavelengths in general will be recommended for use for the beginners and for the spark stations, and as the wavelengths increase, the interrupted continuous wave, the radio telephone, and finally that aristocrat of the ether, the pure continuous wave, will come into its own —at the top, naturally. So that each type of traffic of the amateur will flow smoothly in its allotted band with a minimum of interference and a maximum of pleasure to the amateur."

Dr. Goldsmith thought a most delightful vista unfolds itself before all. "I believe that radio records will be hung up during the next few years of a type previously unimagined," he predicted.

"Radio is the most romantic and remarkable of all methods of communication. It falls into two main divisions, apparently: the two-way communication, or ordinary communication; and broadcasting. Two-way communication, of course, is to be used above all in radio where no other means exist. It is obvious that but few ships will trail a cable after them to land and but few aircrafts will be anchored by a wire to the ground, and therefore these mobile services are exclusively radio, and must remain so. Impossible natural barriers are bridged with ease by the flying wave, and here again we have an unusually favorable condition for the use of radio.

"Broadcast communication which is now engaging so large a portion of our attention is the second great use of radio. Wire communication goes from point to point but radio covers an area. It spreads in all directions. Under its blanket all who wish to hear can hear, and this is one of the particularly useful applications of radio communication. We can do anything with broadcast nowadays!

"I see another aspect, though, of radio," Dr. Goldsmith continued, "of much more important and serious national aspect than even listening to messages and sending them. I mean the cultivation of an analytical turn of mind. When we take the life of the average man we see that he comes but rarely up to the present in the contact with scientific exactitudes, with things that compel logical thought and delicate manipulation.

"Now, for the first time, science comes into the household not only as a means of amusement and communication and entertainment, but as an incentive for training the skilled hand and for developing the analytical turn of mind. A great nation such as ours, spread over so vast a territory, finds difficulty in holding together the millions spread over the stretches from the Atlantic to the Pacific, from the Gulf to the Great Lakes. Radio is the means whereby this great nation can be integrated and moulded into one coherent whole with everybody in touch with the rest. The analytic, scientific habit of thought is to analyze, to think, to examine, and radio is one of the best means of mental training that I know. So I believe in this country by bringing direct analysis into the home it will tend to make us more of a nation of thinkers and of accurate skilled manipulators and still further improve the industrial supremacy of the United States!"

The chairman then called upon members present from each amateur club affiliated with the Executive Radio Council to make themselves known, and the delegations in turn arose, to receive the applause of all the diners. F. H. Schnell, Traffic Manager, American Radio Relay League, was then called upon. He outlined the progress of radio in the year past, observing, "The amateur radio game has moved along so fast that if you drop behind for a week or ten days, it takes you two months to catch up. I have often wondered how many of you listen to the radio concerts every night or help one of the radio listeners who is interested in listening to the concerts. I have had some peculiar experiences with those people. They listen in of a night. They get a little scratchy noise and they want to know what it is. Someone comes along and says, 'Oh, that is the amateur dot and dash.' They want a law passed to stop the amateur from transmitting. Pretty soon they hear a little more scratchy noise — they are going to hear a lot more of it this summer — and they want a law passed to stop static! When they do that, let's all get behind and push."

Speaking of the trans-Atlantic test, Mr. Schnell said that the main issue in the whole thing was: "We fell down the first time in February because we did not allot the transmitters sufficient time during the test to give a man a chance to tune his receiving set. So we decided to give the transmitters a little more time and run the test over a longer period, ten days." Reports were then read by Mr. Schnell of the results of the Governors'-President's relay of 48 States. Forty messages were delivered into Washington. Typical radiograms from various Governors were read to illustrate the character of the communications.

The chairman next introduced the featured guest of the evening, "Paul F. Godley, who went across the ocean to a strange land, set up a receiving station on a barren, storm-swept field in Scotland and was successful in recording the signals of a large number of American amateur stations, some of them approximately 3,500 miles away across land and ocean."

He gave a graphic word-picture of the ordeal of the last few nights of that test, and introduced the successful American representative of the amateurs by saying:

"They say a prophet is without honor in his own country, but Paul Godley is not without honor in the Second District."

Mr. Godley said: "To those of you who are really dyed-in-the-wool amateurs, the carrying through of a test such as this was, is easily understood. I am not the only amateur who has gone through oftentimes seemingly foolish hardships in order to pursue a hobby to its lair.

"I am particularly glad of the opportunity which presents itself this evening to thank all of those amateurs who participated in the tests on this side for their very thorough co-operation," he added. "I put myself in your position over there, and the one thing I feared was that after about the second day a great many of you would say, 'Oh, well, what is the use? He didn't report any signals the first two days, and he isn't going to hear any.' But you didn't do that, to my great delight. You kept right at it.

"Notwithstanding that the first night only one signal was heard, you all came back just as strong the following night, and as a result of that co-operation, we got the great number of signals."

Mr. Godley expressed the belief that the greatest feature of the tests, or the most significant thing in connection with them, and as a result of them, is this: Since the tests were pulled off, the French apparently have gotten the craze; they have licensed amateurs to transmit using 100 watts. The Dutch are also going in for it. The British are strong after it, and the London Daily Mail has assured British amateurs that they will support them in their efforts to put over the desired legislation. Even the Mexicans have gone into it. It won't be long before all of the South American republics and all of the European nations will be letting their small boys play with radio," he thought, adding: "When that time comes, and this international amateur communication becomes an old story, the next thing we will do is try the interplanetary stuff."

Chairman Smith then announced that the Executive Radio Council of the Second District had prepared in permanent form due recognition of the accomplishment of Paul F. Godley in the form of a bronze tablet, which was then formally presented. An illustration of the tablet appears with this article. The amateurs who did the transmitting were next called upon to make their presence known. Eight of the stations' owners responded.

The next speaker was J. Andrew White, editor of THE WIRELESS AGE, who remarked: "As I stood watching Paragon Paul with his bronze obituary in his hand, standing in the spotlight and responding with sad words, I thought, 'Well, it's all over now.' And as we look back at this convention week, we are, most of us, glad it is all over. For last year we had some predictions and some dreams, and they have all come true—so what is the use of predicting for the next year?"

Mr. White spoke of the night before Paul Godley sailed, when a very small dinner was given at which Mr. Maxim was the host. "The question came up in my mind then, of what he was to do, and it seemed to me then that the most significant thing (it has not been brought out here tonight) was that if he did receive these signals across the Atlantic on low-power and short wavelengths, we were coming pretty close to perfection in reception. And when we hear of 20 watts being received across the Atlantic, there has been some progress in reception!

"This perfection in reception means lessening of transmitting power," Mr. White observed. "And it means also the coming to simplicity. Now, with the development of broadcasting and simplicity of receivers, there is no telling where radio will go. No matter where it is going now, there is no forecasting where it will stop. Probably when we come to this dinner again next year we will have a lot of new ideas, a lot of new conceptions, and we will be in a worse position than we are now, wondering what it is all about."

Looking upon broadcasting as radio's most fascinating field, from his personal viewpoint, Mr. White said: "I want to pay my tribute now to the amateurs for what they have done in broadcasting. Back when we asked them — on a few weeks' notice — if they would undertake the reception of the Dempsey-Carpentier fight, nobody knew whether the radio description would be received or not. We just expected it would. Yet the amateurs turned out without any warning, without any preparation, and they did a wonderful job — that description of the fight was heard by 300,000 people, and nobody appreciates more than I do how much the amateur contributed to that. He contributed everything to it! But for the amateur the fight's radio audience would not have been of large proportions—it would have been heard only by a few people idling at home, or a few operators at sea. The amateur took his courage in hand, and with his usual thoroughness, put in his receiver and a loud-speaker and let the public hear it. That was a very big job. It was a job that has a great deal to do with broadcasting as it stands today. With the amateur backing us up as he did, it was proven that the public would like broadcasting."

To illustrate the grip radio has on the public imagination, Mr. White told about a conversation held with one of the fight listeners, who said: "When you talked about that airplane hovering around, I could hear the whir of the propeller," to which the comment was added: "That is the sort of thing that broadcasting does. A radio receiver is not a phonograph. It is a very human thing — super-human, when listeners can hear something that is not there!"

Another illustration was given in the experience of one man in Canada listening to his brother sing in New Jersey, through arrangements made by a Canadian amateur as a complete surprise to the hearer. "I think that is a very wonderful thing," Mr. White commented, "two men who have not seen each other for years, one of them way up in Canada, and he just felt as if the other was in the room. That is the important thing about radio. It somehow projects personality.

"As we have gone through this week with thousands and thousands of persons attending this show — they didn't see anything but the backs of the persons who were trying to look at the exhibits, and yet many more thousands were still trying to get in — we have been wondering whether this is a craze, or whether it is something permanent and real. I believe I heard the question not less than nine or ten thousand times this week, 'When is this craze going to die out?' Somebody compared it to the bicycle craze. That, to me, is no comparison at all. The bicycle was very popular, but you had to go out and pedal it, and all you got in return was in keeping the weight down and getting a little fresh air. But radio is something that comes into the sanctity of the home. It does not require any physical or particular mental effort and the character of the programs take many different forms. Consider a serious form: One of the latest thoughts, a designation that impressed me very forcibly, was that of a clergyman who said a blessing on a broadcasting station as a messenger of God!

"On the less serious side: I met a man day before yesterday who said he had often listened to the programs. He is a very fine musician, and I wanted to have his expert musical opinion. This was the opinion

E. F. Glavin and his wirelessly controlled car was the life of the party. Two or three demonstrations were given every afternoon and evening, in which Mr. Glavin clearly demonstrated the practicability and ease of controlling vehicles by radio

I got: 'I am glad I have found something where I can attend church services on Sunday and still smoke my cigar.'"

LOOK WHERE YOU'RE GOIN'.
A WIRELESSLY CONTROLLED CAR—A CROWD—AND A MAN WITH A CORN.
HELLO 2AOW—JUST SAW 2BQX WITH 2DK.
AT SO. WHERES 2BJO? Y'KNOW 2LH AND 2UA AREN'T ON SPEAKIN' TERMS ANYMORE
2OM
2AOW
IT'S A GIFT TO TALK THE LANGUAGE.

As the New York Globe artist saw it

Mr. White stated that radio coming into the home with a varied type of program would have an enormous national influence. With an anecdote he illustrated the discovery that the projection has been found to be the reverse of what was expected; the listeners feel that the people who entertain by radio seem to get into the room. "With the listeners in a receptive attitude, as they are bound to be in carpet slippers and dressing gown, sitting at home, off guard, there is an opportunity to put in some very real, some very valuable, things," declared the Editor of The Wireless Age, adding: "This, too, will always have its element of danger. Programs must be very carefully controlled. In that, again, is something that the amateur can do; where his counsel will be of value. Amateurs are good listeners; they are quick to respond; will co-operate, and are faithful in reporting on anything that they are asked for. And that is one of the things that they can't do too often—take their pen in hand to write and say, what is the matter with the programs; how can they be improved. Among our radio listeners, the nucleus is the amateur — and he will never die — and now with the public rushing in as it has rushed in within the last few months, and will continue to rush, radio is something so very big that it can't be styled a craze. It is up to the amateur now, in these early stages, to steer it so that the best results will be gained."

K. B. Warner, editor of QST, was the last speaker. His subject was the Radio Conference at Washington, about which he observed:

"We are in a ticklish place right now, fellows, and it is not all over by a jugful, but I think amateur radio can consider that it has received a very splendid recognition in the progress of the Conference up to date. The Radio Conference has gone on record as favoring that the wavelength band from 150 to 275 be allocated to amateur purposes, and all of the amateur testimony at the hearings was by way of a request that that wavelength band be subdivided among the respective amateur services according to the classes of transmitters. So that we have every hope that when the Secretary of Commerce is given additional authority to administer amateur radio as that department so sadly needs at present, we will find the band from 150 to 275 specified as assigned to amateur purposes and that the Secretary will follow the recommendations and subdivide that among the various amateur classes.

"In connection with the allocation of those wavelengths among various services, we amateurs are going to have to police ourselves, and by means of deputy inspectors chosen from our midst do what we should, and I would like you fellows to carry home a little thought with you right along that line. You know that amateurs have been improperly blamed for a great deal of interference with broadcasts. Some of it has been induction, some of it has been amateurs, but a great deal of it has also been ships and commercial stations. They all have been offenders, but the amateur has been blamed for almost all of it and we know to a great extent improperly.

"Let us try to help the broadcast listener who is often handicapped by the possession of a tuner that will not tune as sharply as our amateur equipment. Let us help him by giving a lift in his receiving troubles, let us feel it a duty to point out to him that the amateur is not the cause of all radio trouble, let him know that the amateur is something else than a nuisance, that he is a national asset in time of danger, that he is a contributor to the scientific progress of the art. And from your own standpoint have some respect for the rights of the listener, and where the listeners outnumber the amateur transmitter by many times, I think you should feel that the sentiment of the majority should be respected. And another thing that is most important, be very sure that you stay within the law in the operation of your transmitters.

"The Secretary of Commerce in future will probably have power to regulate operating hours and ranges to an extent that he deems best for the general public interest. Be very careful then that we do not make nuisances of ourselves, but show on the other hand, that we are a public asset.

"I feel that I must take this occasion to state that although the American Radio Relay League is primarily an organization of telegraphing amateurs, we feel that there is certainly plenty of field for all classes of amateurs, and we certainly had no part in the present restrictions on amateur broadcasting. Except that we feel that all amateur services should be segregated on separate wavelengths, we have no quarrel at all with amateur broadcasting; nor on the other hand, has it been the intent of the League to subject the radiophone to the relay telegraphy, as we feel that subdivision among those classes of stations should be by order of their interference proclivities, which we think would place them in the order that was universally recommended at the hearings in Washington."

The banquet concluded with an invitation to all present to come forward and meet in person Paul F. Godley. The response was so generous that it was nearly midnight before the informal reception broke up.

Everybody who attended the dinner this year commented on the excellent seating arrangements. The plan had been so well carried out that the 1025 diners had no trouble in easily finding their places at the tables. Credit for these arrangements belongs to John Di Blasi, of Continental. He was assisted by his side partner, Joseph Stantley.

Leroy Watkins of Gloversville, N. Y., the "money" man of the Council, was the busiest man in New York City during the show. Checking up approximately $2,000 in small change each night is quite a job.

Strays and Sidelights

A REPORTER for one of the New York newspapers was interviewing J. O. Smith and, referring to the great advances radio has made, asked Smith if he would be surprised at some time in the future, to be able to take a small transmitter from his overcoat pocket while walking along the street and call up a friend in some remote part of the city, without the aid of wires. Smith replied that he certainly would.

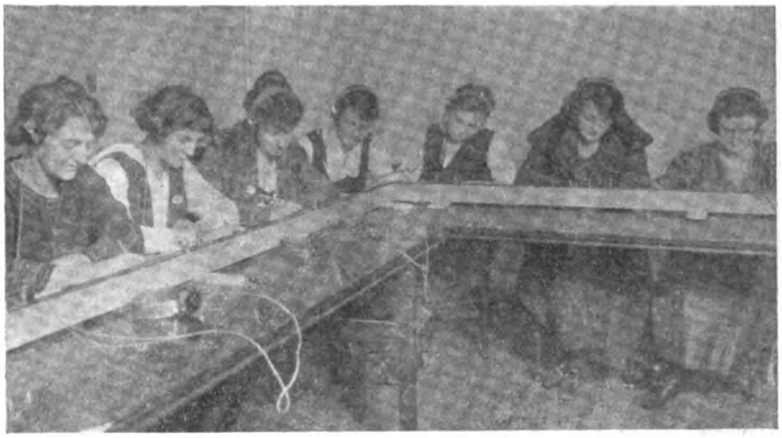
One New York newspaper, in describing the show, said that the hall was full of "talkies," "singies" and "buzzies," whatever they are. Sounds like a cub reporter in love. But of course it's Spring.

R. H. G. Mathews, the well-known 9ZN of Chicago, arrived early, bringing the charming Mrs. Mathews with him. Mrs. Mathews braved the crowds about the hall for one night and then decided to watch the affair from the side lines for the rest of the time.

From far and near they came, the "far" distinction going to A. R. Oberson of Candiac, Saskatchewan, Canada.

Was there a crowd at the show? Ask Douglas Rigney of the Grebe Company, he knows.

Oh, that Radio Ball! Just as everybody was congratulating everybody else that it was time to go home on Friday night, along came Capt. Robert S. Wood, Radio Editor of the Evening World, with an invitation to everybody to join the merry throng at the Radiophone Ball at Terrace Garden. And so everybody went and a good time was had by all. The affair was remarkable, in the first place, for exceeding expectations in attendance, special stunts and general interest. Dance music from WJZ came out of the loud-speaking equipment in great volume, and the thousand or more dancers enjoyed themselves immensely. Uncle Ed. Glavin and his Wireless Pup waltzed and fox-trotted the gathering with as fine a demonstration as has ever been staged. Uncle Ed's lecture during the demonstration was particularly interesting and enjoyable. E. W. Dannals and Boss Lowlass deserve much credit for their expert handling of the loud-speaking equipment.



The Code Speed Contest for Women brought together the best operating talent of the fair sex. A speed of 30½ words per minute, perfect pencil copy, was made by the winner. Miss Ruby Yelland, who is at the corner of the two tables

The corner of the Roof Garden occupied by the exhibit of the Radio Corporation of America, was the scene of great activity during the entire show. Many new devices were exhibited and they attracted crowds of "dyed in the wool" amateurs, as well as those mainly interested in broadcasting. One item which attracted great attention was the Aeriola Grand. All of the apparatus of this outfit, including a loud-speaker horn, is contained in a beautifully finished mahogany cabinet, to which it is necessary to connect only a storage battery, antenna and ground wire. A single switch controls battery current for the filaments of the vacuum tubes and the intensity of the signals and their wavelength are controlled by a single variable arm.

The Aeriola Grand is provided with eight vacuum tubes. There is one detector, three stages of audio-frequency amplification and the other four tubes are ballast tubes used to control the filament current in the detector and amplifier tubes.

Among the new models which also received a great deal of attention were the General Electric twins—AR-1300 and AA-1400. The AR-1300 is the new single-circuit receiver developed by the General Electric Company and is fitted with a replaceable inductance for use in connection with various wavelength ranges. Where this set is used as a crystal receiver, it is merely necessary to connect the antenna and ground wires, insert a telephone plug in the jack provided, and adjust the crystal detector found on the face of the front panel. Wavelength regulation is entirely controlled by a single knob.

The AA-1400 — the twin brother to AR-1300 — is a unit made up of General Electric accessories, especially designed for use in conjunction with the tuner just described. One outstanding feature in connection with this unit is that one stage of radio-frequency amplification has been provided. The remainder of the circuit comprises a detector and one stage of audio-frequency amplification. The vacuum tube sockets have been mounted on individual shock-absorbing bases. Another receiving set made by the General Electric Company is known as the ER-753, and is a complete crystal receiver having a single wavelength control which has been especially designed for use for radio broadcasting reception over comparatively short distances.

A receiving outfit which attracted great interest was the six-tube amplifier built by the Wireless Specialty Apparatus Company and exhibited at the Radio Corporation's booth. This amplifier has been designed for use in connection with loop aerials, although but six vacuum tubes are employed, 5 stages of radio-frequency amplification, a detector, and two stages of audio-frequency amplification are made possible because there is a feed-back arrangement wherein two of the vacuum tubes perform two distinct kinds of duty. This very distinctive amplifier is fitted with but two controls and should be very popular in connection with loop reception from broadcasting stations, for which it was specially designed.

For the first time in the history of radio, a song was specially written for the occasion. Before the week was over every man in the place was singing, humming or whistling "Kiss Me by Wireless." The young ladies seemed less thrilled over the osculation by proxy idea.

On the second day of the show a nearly-solid gold violin was presented to Chairman J. O. Smith by Michel Hoffman, noted Russian violinist, who has played to big houses via WDY. All important parts of the violin were appropriately labelled. The bow was the "tickler," the neck of the violin was the "tuner," and the keys "frequency changers." The violin, about half regulation size, was mounted upright on a porcelain base. It attracted a great deal of attention during the show.

It's a lucky thing Vice-Chairman R. H. McMann is a slender chap. He was the only one of the committee who could work his way through the crowds to attend to the wants of 65 exhibitors.

Late one evening, after John Grinan (pre-war 2PM) had answered 99,999 questions, touchin' on and appertainin' to the subject of radio, somebody came along and asked him how to properly insulate an earth ground. Right there is where John quit and the radio world will probably never know the answer to this important question.

An elaborate crystal receiver, made up in an artistically decorated metal case, was found at the Radio Corporation's booth. This receiver had a wavelength range of 180 to 2650 meters in three steps. These steps were controlled by a three-point rotary switch and variation within the different ranges was effected by a single control knob fitted with a pointer made to move over a calibrated dial engraved on the bakelite panel.

The Aeriola Sr., which was exhibited by the Radio Corporation, is the first receiving outfit to be put on the amateur market wherein a vacuum tube may be used in conjunction with a single dry cell to heat the filament. Advantage is taken of the regenerative circuit and this formerly delicate arrangement has been reduced to a point of simplicity, permitting those entirely unfamiliar with radio, to employ it satisfactorily.

The Lyradion, a combined phonograph and radio receiver, attracted much interest during the show

William H. Edwards, former Collector of Internal Revenue, visited the show and was taken in charge by a group of young enthusiasts, who explained in detail all the wonders of radio-land.

Two groups of enthusiasts, the broadcast receivers and the amateur transmitters, indulged in many discussions during the week, generally resulting in a better understanding by both sides of the problems involved.

On the Sunday following the show five elevator boys of the hotel reported off with lame arms.

The United States Radio Inspectors, headed by E. A. Beane, were kept busy during the entire show examining applicants for amateur licenses.

During the show one of the New York newspapers referred to Paul Godley as "a radio engineer, of Ardrossan, Scotland." Such is fame.

One young woman, who was too pretty to be able to understand, after watching Uncle Ed Glavin control his little car by a wave of his hand, exclaimed, "Oh, isn't he a wonderful hypnotist!"

The speed of 30½ words per minute, pencil copy, made by Miss Yelland in the women's code speed contest, made many of the Boiled Hams wonder.

When Chairman Smith introduced Jack Binns and Paul Godley to each other there was a round of applause from the nearby spectators. The operator of the Republic and the engineer of Ardrossan represented the ultimate in their respective accomplishments and the crowd evidently wanted them to know that they knew it.

The booth of the American Electro-Technical Appliance Company, where the new Western Electric loud-speaker was demonstrated, was surrounded by crowds 20 deep whenever the outfit was in use. The music of the Radio Corporation-Westinghouse broadcasting station at Newark came out in such volume as to be plainly heard over most of the Roof Garden. This new loud-speaker reproduces music practically without distortion. In addition to the horn itself, the outfit consists of a power amplifier, which employs three Western Electric tubes specially designed for the purpose. This new loud-speaking equipment will be available for the retail trade in about six weeks.

The exhibit of A. H. Grebe & Co. contained two cabinet type receivers which attracted visitors to an extent that kept the booth packed full during the whole show. One of these, the "Radiotone," was an upright type phonograph cabinet, containing the latest type of Grebe receiving equipment and considerable amplification. A still larger Console type cabinet called the "Radionelle," contained both a phonograph and radio receiving equipment, making it possible to use the phonograph sound box and sound magnifying qualities of the outfit for either records or radio reception.

Guy R. Entwistle, of Boston, was on hand again this year during the entire week, reporting everything of interest to the Boston Traveller.

English Radio Exhibition

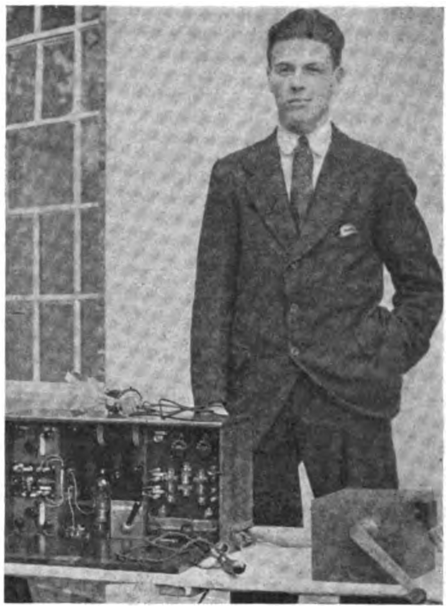
An exhibition of radio material and equipment was held recently at the Gloucester Baths by the Glevum Radio and Scientific Society, Gloucester, England. The secretary of the society, in his report of the affair, states that "our members had three days' strenuous work, answering questions and obtaining signals for the crowd which besieged the hall." The affair was declared to be a decided success and the enthusiasm of the schoolboys and their intelligent inquiries were declared to promise well for the future development of wireless.

Great Britain's Radio Sky Line

Some of the Startling Things that Have Been Accomplished by the Radio Men in Great Britain

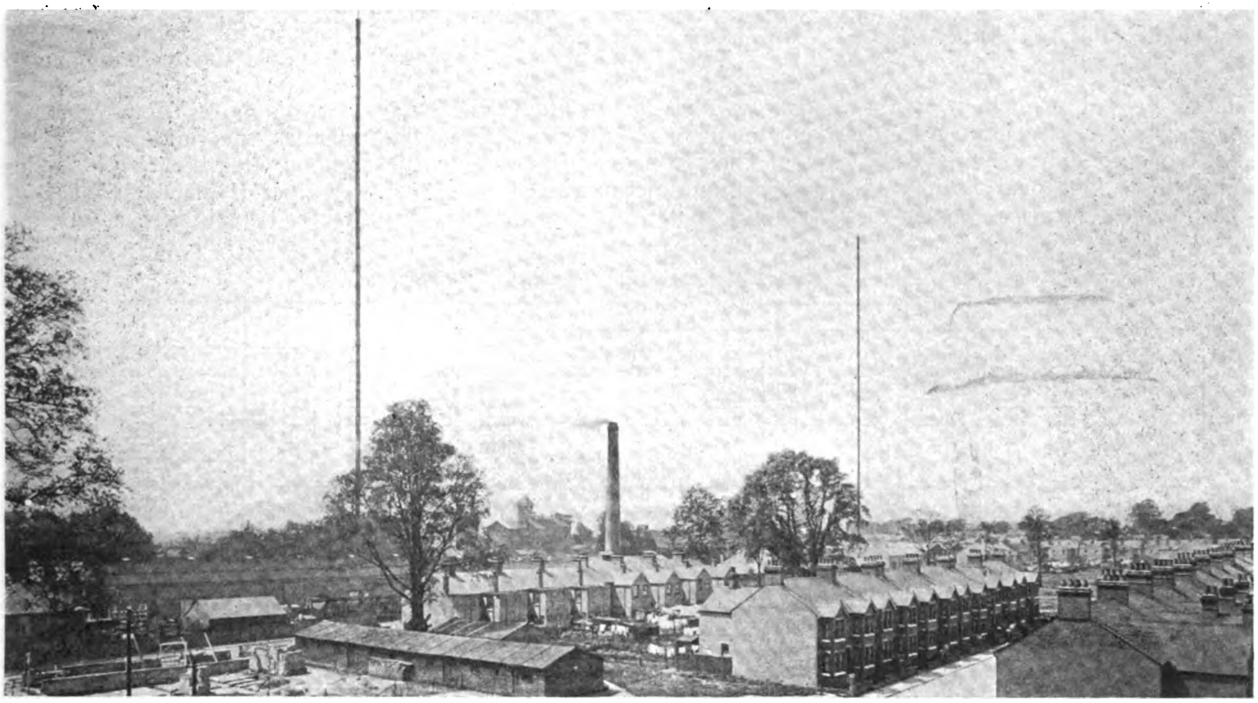
By Paul F. Godley

IF you are an American, and also, if you chance to be an engineer, student, experimenter or amateur who has been fouly pursued, bitten and infected by the insect Radio you have, whether you know it or not, long since rabidly consecrated yourself to an endless search for relief from an incurable itch. In fact, this hunger for new cure-alls has become a devouring passion well-nigh controlling your whole subconsciousness and you awaken in remote and strange places to catch yourself diligently engaged therein. Without fear of successful contradiction it could even be said that were you to be placed forcefully, or otherwise, on the frozen flats of the barren polar regions your first perceptible performance would consist in giving the polar sky-line the once-over, while your first coherent expression would be one of regret arising out of your failure, prior to embarkation, to interview the available authorities on "Types of Ice House Best Suited for Antenna Support."



Type YA1 Marconi 20-watt transmitter and receiver. Note the hand-operated generator.

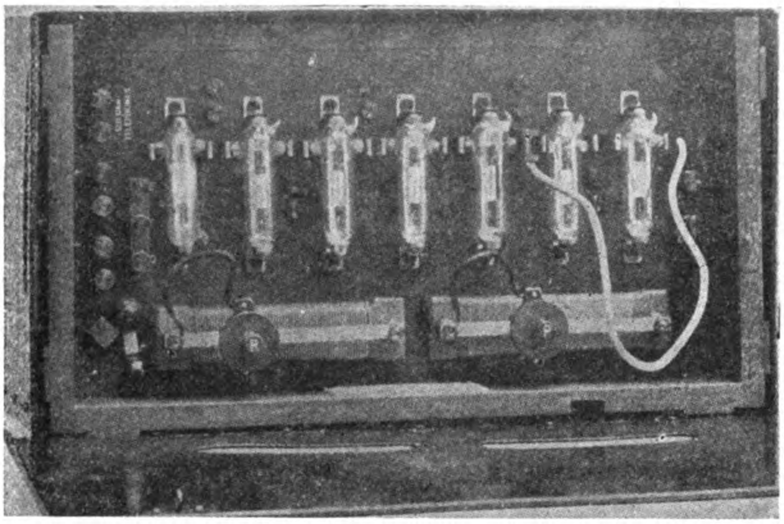
Speaking as one who, it may be said, has contracted the infection, I recently found myself ensconced together with a member of the Chinese diplomatic corps in the very comfortable compartment of a first-class railway carriage which was slowly moving from the train sheds in Southampton bound for London. The walls of this compartment were wonderful to behold. Everywhere thereon were to be found beautiful pictures of Southern England's enticing sea-side places, hatracks and luggage carriers and gadgets which I can never name. To both of us England was a strange land. The people, and their methods, the conveyances on the streets, the architecture, the landscape, the transportation system, and, to a certain extent the language—all were different. My Chinese acquaintance proved quite talkative and had a keen eye for those things which were unusual to an American resident, but I awakened presently to the knowledge that he had quieted and had for some minutes been following my eyes in an effort to see those things which I had been seeing. I had given but scant attention to the quaint old English houses, their winding dirt lanes and carefully tilled fields or to the many new natural beauties on every hand. Realizing, and with no idea of answering the question in the Chinese gentleman's eyes, I reviewed the picture presented for the past hour. It was a wonderful picture—40 miles of sky-line and nothing more; unpunctuated, even, by a single antenna. That antenna is what I had been looking for!



The English Marconi Works at Chelmsford, Essex

A great deal more of looking had to be done before the first was discovered. Like the first, those which put in their appearance later were much abbreviated in form as compared to their American counterparts. For this there is a reason, and a good one. The British Post Office, which controls all amateur radio in Great Britain, forbids the use of more than about 140 feet of wire total in any antenna unless exception is granted by very special permission. These antennae usually had about two wires, which means that their total length was approximately 70 feet. What manner of communication, then, did these amateurs maintain? What types of equipment did they use? And, were these Britishers, who really have contributed a great deal to the advancement of the art, mainly scientists, and book-writers, or were they "dyed-in-the-wool" amateurs and manipulators too, and what was the percentage of each, and what were they like?

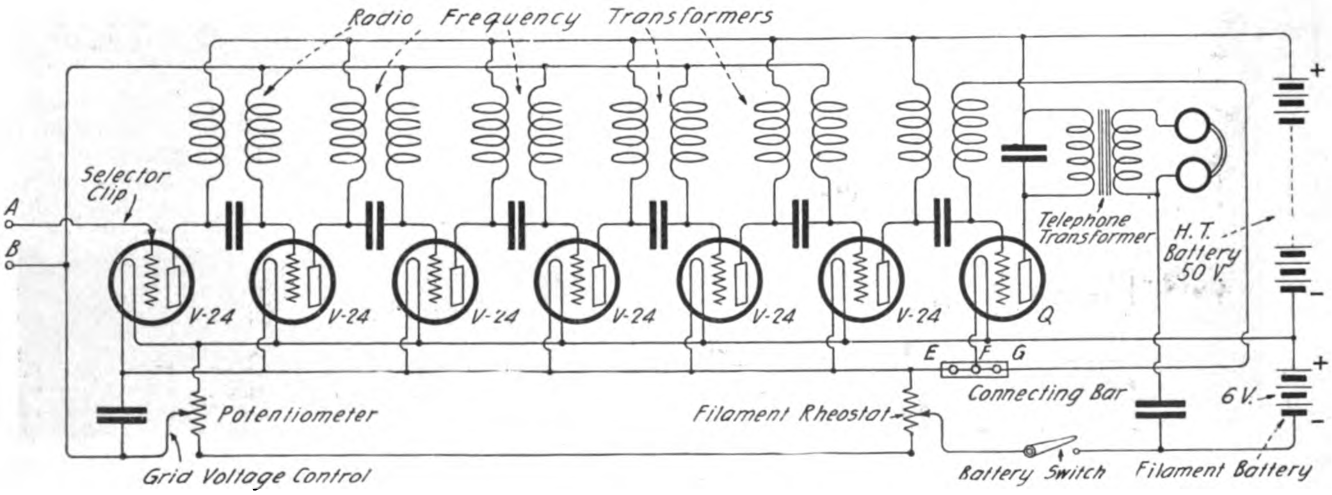
I found many of them grouped together at meetings of their societies,—the first a meeting of an amateur organization, the Wireless Society of London, and the second a meeting of a physical society, the Royal Society of Arts. To my great surprise, the age of members of the amateur society averaged close to forty years. The greater part of these men had families, and many of the faces were adorned with mustache or beard while but few were in their mid-twenties. But, be their age what it may, and regardless of the cut of their facial adorments, or their profession, calling, or job, I was by no means unacquainted with their habits and mental processes. Amateurs and physicists alike— all had been bitten and had as their chief aim the swapping of information on itch lotions. However, I feel free to admit that we Americans could give them all the aces in the deck and beat them at it. It has been my observation and it is my firm belief that for "dope," "hunches," and sure-thing, inside information the American would-be radio convalescent has all others tied to the post.



Marconi multi-stage amplifier using six radio frequency tubes and one detector

England has no mean quota of radio medicine men. Neither can the potency of their concoctionss be gainsaid. But it might be intimated here that the more potent the application the more violent the breaking-out in new places. Chief, and senior of those I encountered is: J. A. Fleming, M. A., D.Sc., F. R. S., etc., etc., scientist, educator, author, who, although well along in his seventies is still very active. Rather small in stature, slight, quite gray, and somewhat bent, his very keen eyes peer beneath a shaggy brow and coupling with quick gesture unfalteringly drives home point after point as he reads his remarkable lucid lectures. Nor, does he ask one to depend alone upon his text, though this would seem quite enough, but he freely illustrates by the use of carefully set up demonstrations through the medium of well trained assistants. Usually the "setting off" of the demonstration entails not the slightest pause in the flow of words. This was true to such a great extent that when he had finished I marvelled at the vastness of the ground he had covered, the thoroughness of the treatment and the perfectly timed smoothness of the demonstrations.

With one exception, all of the dozen or more "set-ups" were manned at the proper time by an assistant. This one exception was the demonstration of the "feed-back" method for the production of continuous oscillations. For this, Dr. Fleming used his own "ear-phone" and its sensitive microphone attachment, for he is quite deaf. This experiment may be performed with any standard telephone instrument and is accomplished by placing the receiver against the transmitter. If in striking the mouthpiece of the transmitter the receiver jars the carbon granules of the microphone a sudden change of current flow will take place in the circuit and be communicated via the transformer coil to the receiver which, due to the resulting motion of its diaphragm, will again disturb the quiescence of the microphone, etc., etc., etc. So long as the receiver is placed in such position as to feed some energy back into the microphone, this reaction will continue indefinitely at a frequency of approximately 400 times per second.



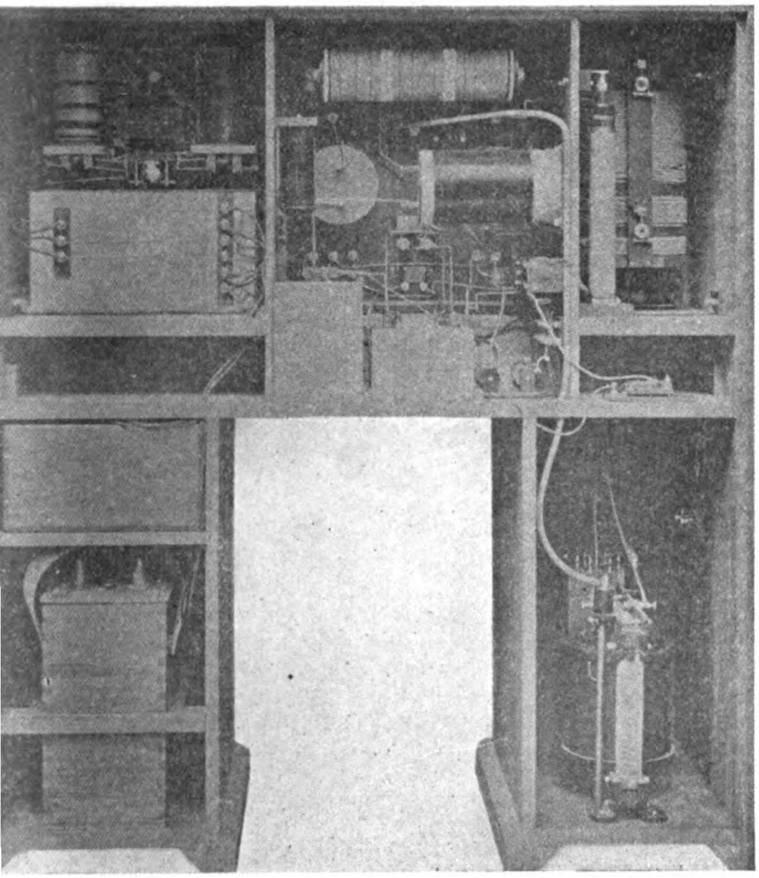
The cascade hook-up using six tubes for radio frequency amplification and the seventh tube as detector

In his attempt to demonstrate this action, the doctor's affliction handicapped him. After several efforts, he came to the conclusion that his apparatus had gone out of order. That it had *not* was apparent to every one else in the room,—so much so, that one of the assistants was sent to shut the thing off so the audience might hear, for, although a bit nettled, the doctor had gone rapidly ahead with his lecture.

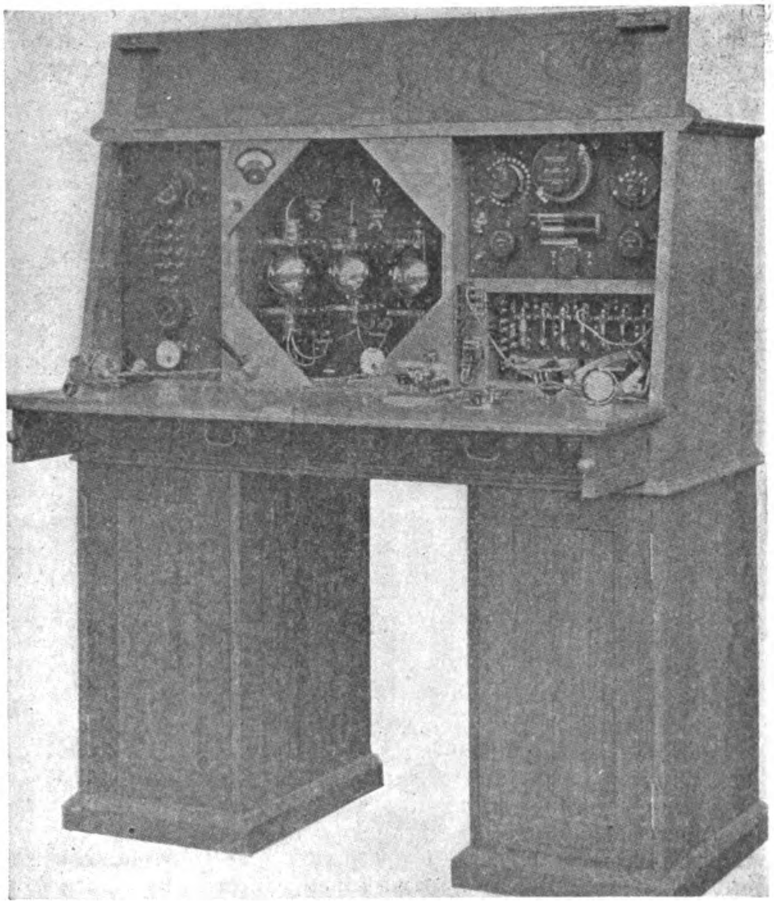
Some of the most startling things that have been accomplished by radio men in Great Britain since the war are: (1) the installation at Carnarvon, Wales of a tube transmitter which successfully communicates with Australia; (2) the operation for the past eighteen months of a high-speed, automatically recording duplex telegraph circuit between London and Paris; (3) the successful operation on wavelengths between 90 and 100 meters of a duplex telephone circuit between London and Amsterdam; (4) the development of low cost vacuum tubes capable of dissipating several kilowatts of energy; (5) the production of an excellent receiving tube which draws but 1-10 ampere on 3½ volts; and (6) the transmission of signals over considerable distances on wavelengths of six or eight meters.

As for amateur work, there is no relaying of traffic and no broadcasting. Lacking the zest which relay work and broadcasting gives to the game, British amateurs have notwithstanding, developed themselves some very good equipment, though as such, amateurs have not contributed to the advancement of the art to the same extent as have their confreres in America. Relay work is prohibited by the British Post Office. In the judgment of the GPO authorities, to permit it would mean a certain decrease in the revenues which accrue to the government overland telegraph systems. Further, amateurs are restricted to the use of an input of 10 watts for the transmitter. Under these circumstances, the transmitter takes the form of one or two small vacuum tubes connected with capacities and inductances very similar in physical dimensions to those to be found in their receivers, and the energy is passed out into the ether on a wavelength of about 1000 meters, although they have available a shorter wavelength of 180 meters.

In attempting to make up for the limits placed on the power of their transmitter, they have gone in strongly for amplification with the result that a few British amateurs have built for themselves radio-audio frequency amplifiers having 5 to 10 stages, though the average British receiver more than likely consists of a single stage of radio frequency amplification, a detector and a single stage of audio frequency. To my great surprise the audio-frequency transformers in most common use in Britain were American built. Transformers built in Britain for amateur use were comparatively crude of construction and not so efficient, and this also might be said to be true of the greater portion of the manufactured amateur apparatus. The reason is apparent. It is estimated that their are but 5,000 amateurs in Great Britain. Lacking the market, manufacturers have been unable to make the outlay necessary for the development of really good lines, and are forced to use designs which are somwhat crude, in appearance at least, and to build the greater portion of the equipment by hand.

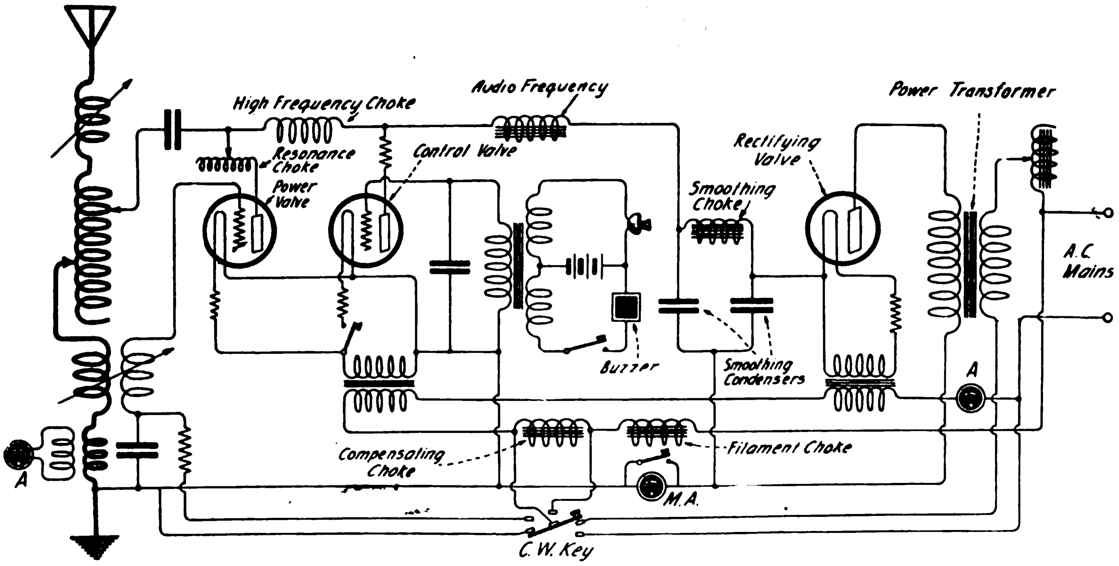


ar view of the ¼ kw. C. W. transmitter with receiver. Note receiver in- ctance at top left and shielded amplifier case immediately below. Plate and ilament batteries lower left and high voltage transformer lower right.



Front view of the ¼ kw. C. W. transmitter. Note transmitter control at left. one oscillator and two rectifier tubes in centre and seven-tube amplifying receiver at right. An ideal arrangement for a real amateur station

The radio frequency portion of their circuit has, however, been developed to a further degree than has our own. This is due partly to their failure to fully appreciate the advantages of the tuned plate circuit regenerative receiver, to their lack of "gassy" tubes, and to their tendency to work on 1000 meter wave, at which wavelength the accomplishment of good amplification at high frequency is a somewhat simpler matter than on those waves which are allotted to amateur use in this country. However, in some quarters there seems to be the opinion that too little is known of effective and handy methods for accomplishing this sort of amplification, though some amateurs have rigged for themselves some fairly effective, but not very flexible outfits. Accompanying this article is a photograph and circuit diagram of a seven tube amplifier as manufactured by the Marconi Company for commercial use. Many of the amateur amplifiers pattern after this circuit, though some omit the small fixed condenser shown as connecting the grids with plates of succeeding tubes. As to the transformer itself, some have been made by turning a groove ⅛ x ⅛ inch in a hard rubber or hard wood rod 1¾ inches in diameter. Wound in this groove is a primary consisting of 30 turns of No. 40 D. S. C. C. This winding is covered with a layer of thin Empire cloth, and a secondary wound on consisting of about 35 turns of the same winding. The primary of this transformer goes into the plate circuit and is shunted by and tuned by a small variable condenser, being good for a range between 180 and 325 meters. Where such transformers as these are wound for use without the variable condenser — as they may be by a litle experiment — the range of wavelengths covered will be considerably narrower.



Circuit diagram of the ¾ kw. transmitter

A variation of this method, and one which is interesting, is that adopted by the Marconi Company. The transformers are wound on hollow cores somewhat after the fashion described above, and so arranged that a paraffin core which has been impregnated with iron filings slides in and out of each transformer. The iron in this core is so finely divided that very little eddy-current loss occurs in the iron, yet sufficient iron is present to greatly vary both the self and mutual inductance of the transformers, giving them a comparatively wide operating range.

In all of these amplifiers, it is necessary to use a potentiometer across the "A" battery, to the slider of which all the grids of the outfit are connected as shown in the diagram. This provision is made to prevent oscillations, and where more than two radio frequency tubes are used it begins to be the practice to have the whole amplifier in a case which has been lined with copper and connected to the negative terminal of the lighting battery to further prevent the stray electric fields from setting up oscillations in the outfit.

A visit to the Chelmsford works of the Marconi Company will disclose many types of amplifiers being built for use on board ship, for direction-finding work and for use in aircraft. All follow the same general principles of design, however, being altered here and there to more particularly fit certain exact requirements.

A four-element tube of rather an interesting nature is also being manufactured and is coming into quite general use for ordinary ship service. A photograph of the tube is shown herewith, and it will be seen that in appearance it is not unlike the three-element tube also pictured. The circuit diagram on the other hand shows some differences. The three inner electrodes of this tube carry out exactly the same functions as the three electrodes of the ordinary V.T.

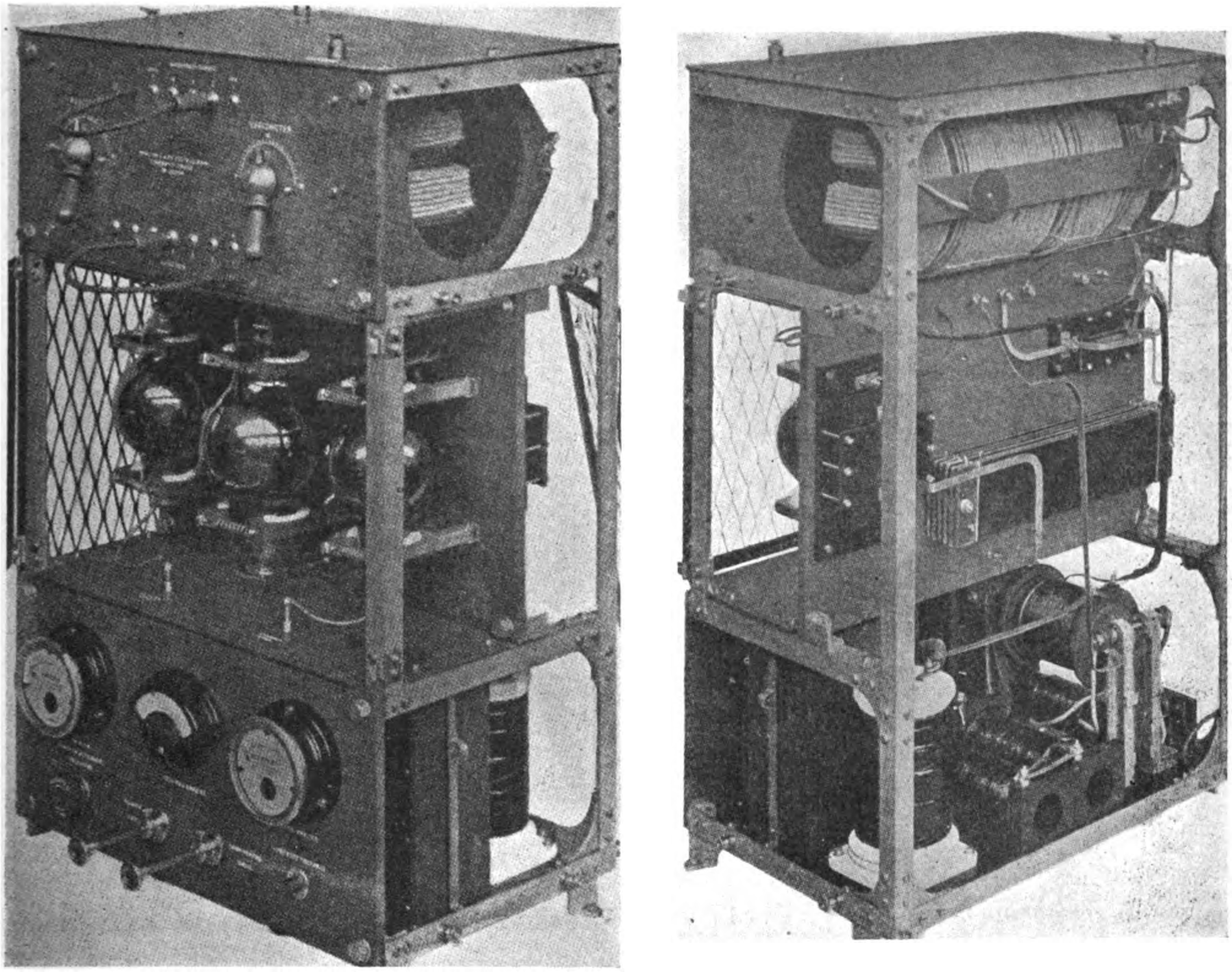
The plate is connected, through the secondary winding of the high-frequency transformer, to a potentiometer shunted across the filament battery — the primary winding of this transformer is in the second grid circuit. By this means the plate potential can be varied between limits of a few volts above and below that of the filament. Some of the electrons which are emitted by the filament pass through the second grid and fall on the plate; but, as the potential of this electrode is practically equal to that of the filament, very little current will flow in the plate circuit. The characteristic curve of this current with respect to the voltage is very similar to that of the ordinary vacuum tube rectifier (Fleming valve). Thus, if symmetrical oscillations occur in the primary of the transformer they will induce in the secondary a symmetrical E.M.F. variation which will produce an unsymmetrical or rectified series of oscillations in the plate circuit, provided that the potentiometer is adjusted so that the point of working is on or near one of the bends of the curve. the rectified oscillations so produced are fed back into the first grid circuit by means of the audio-frequency transformer. At this stage the second grid acts as an audio-frequency amplifier, and the signals are passed on to the telephones. It will be seen then that the tube has performed three functions; that of radio-frequency amplifier, rectifier and audio-frequency amplifier.

Most interesting of all at Chelmsford were the vacuum tubes of various sizes. There is shown here one of the medium-sized transmitting tubes. Contrary to American practiced transmitting tubes are unbased. Cost of base is thus saved, and one other great advantage offered, namely, that even the larger tubes may be made of ordinary lead glass, for the weak spot in the larger tubes is in the stem where the terminals and leads from the electrodes are brought out. Here, when the high potentials are applied, the heat does its work, slightly softening the glass and allowing disintegration of the glass due to electrolysis. This electrolysis will eventually so affect the glass that it becomes porous, and a certain amount of air will be allowed to leak in.

In using their transmitting tubes, the Marconi company arrange a small air line so that a stream of air is at all times blown down into the stem, thus keeping this vulnerable point cool and preventing disintegration. A careful examination of the photograph of the tube set at Carnarvon will disclose these air lines in the form of white rubber tubings running to each tube. In the end of the rubber tubing is placed a little glass nipple, which protrudes within the stem.

By virtue of this cooling method, the forty-eight tubes shown in this photograph easily give the same antenna current as the high-frequency alternator (200 Kw.) which is in use at Carnarvon for American communication, and, upon occasion the tube set has been able to supply close to 300 Kw. to the antenna. A tube set of this type — twelve tubes — has been in use at the Clifden station of the Marconi company for some time. When it was decided to make the change-over from spark to C. W., it was possible for the engineers and workman to carry all the necessary component parts for the new set to Clifden in suitcases. The Clifden station communicates regularly with a similar station in Newfoundland.

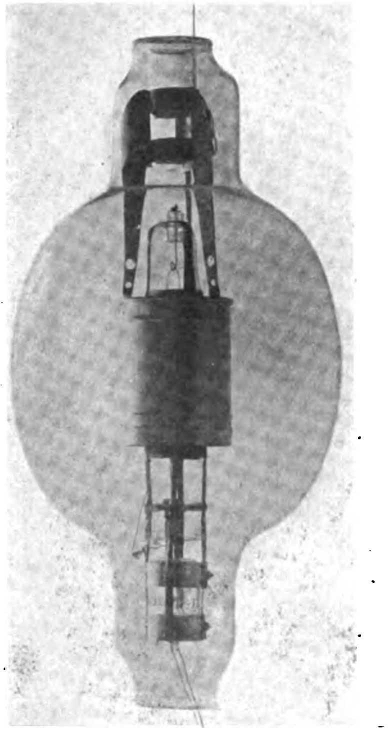
Of interest also are the ¼ Kw. and ¾ Kw. cabinet sets illustrated. Designs such as these should prove ideal for the use of the American relay amateur. They are extremely compact, simple in design and operation, and of such nature as to properly grace the library or operating room of any amateur. Circuit diagrams and photographs make the construction and design fairly clear to those who have had experience with C.W. transmitters, the main feature of the design being the inductance unit, which is built so as to include grid inductance (variometer) plate inductance (tapped for wavelength and adjustment) and antenna inductance (also variometer).



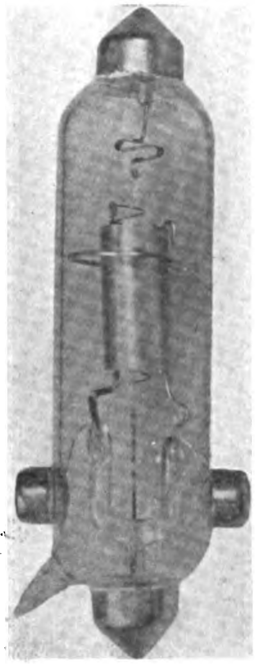
Front and rear views of ¾ kw. transmitter. Note power control and meters below and oscillation circuit control above. An ideal arrangement for the amateur station de luxe

A small receiving tube, very similar in size and appearance to the Standard Marconi tube illustrated, also proved extremely interesting. This tube contains a low temperature filament, and consumes an exceedingly small amount of energy since it draws but 1-10 of one ampere on 3 1-5 volts, or 0.35 watts. Such a tube as this should prove ideal for any use, particularly in the home. Six of them which were brought back from England have proved very good for all purposes, and all six, when running together consume but slightly more than ½ ampere of filament current. The size of the electrodes in these tubes and the method of bringing off terminals gives them a very low internal capacity and thus renders them highly desirable for high frequency amplification purposes.

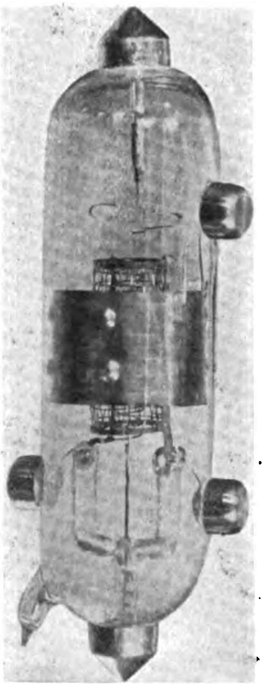
At Chelmsford, also, was the transmitting unit of the high speed circuit running from London to Paris (wavelength 3000 m), the most novel feature of which was the signaling key, which broke the high-voltage plate supply line, the breaks occurring immediately above the opening of a 1½-inch or 2-inch pipe through which shot a continual blast of air. This blast of air blew out any arc which might form, though when the keys were in operation to all appearances the arc was continuous. That the break was a clean one was proven by listening in on a side circuit arranged for the purpose. Speeds up to 170 words per minute have been satisfactorily run on this circuit, though normally the speeds used lie in the neighborhood of 120 words per minute. Each message is sent through twice. This is done to obviate necessity for repetition of parts of messages, for if some stray should happen to wipe out a word or a portion of a word, not one time in a thousand would the same word be damaged during second transmission. This method would appear to reduce the speed of the circuit by half. The service furnished between London and Paris offices over this circuit is said to average about six minutes from filing of message to its delivery, the greater portion of the service having to do with stock exchange quotations and buy-and-sell orders.



Marconi transmitting tube, type MT6. This tube is similar to the tubes used at Carnarvon, except that it is smaller



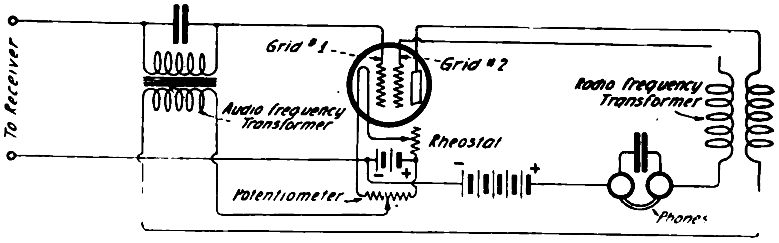
Standard Marconi receiving tube, type V24



Four-element tube used as a combined radio-frequency amplifier, regenerative detector and audio frequency amplifier

The receiving unit is located a few miles out from Chelmsford. A visit discloses a low building about 20 x 50 feet. Quite near the building is erected a Belini-Tossi type of directive antenna, this type being used to minimize interference and atmospheric disturbance. The receiving circuits comprise a tuner, four or five stages of radio-frequency amplification, a rectifier, and three to five stages of tuned audio-frequency amplification. Each stage of audio is placed in its own wooden case. This case is shielded inside with an aluminum shield, and outside with a galvanized iron casing, the stages being set several inches apart. Tuning of the audio-frequency circuits further frees the signal from strays. The audio-frequency amplifier finally feeds a vacuum-tube bridge relay, and current variation in one arm of the bridge averages 15 to 18 milliamperes, which current is used to actuate a polar relay, which in turn controls the recorder. Signals taken on a rapidly running tape recorder are perfect in formation and may be read without the slightest difficulty.

What it is possible to do on the shorter wavelengths is well illustrated by the installation at Southwald on the channel, which station works duplex telephony with Zandvoort, Holland, a distance of 115 miles. The wavelengths used are approximately 97 meters and 100 meters, respectively, a separation of 3 per cent. Service over this circuit is highly satisfactory during daylight hours, but frequently becomes very uncertain at night, not on account of total loss of signals, but on account of the fading effects with which American amateurs are so familiar. Signals vary greatly in strength during these fading periods, and in addition to this, speech becomes more or less garbled due to distortion enroute or due to the out-of-phase arrival of impulses which have traveled over a different route. Considerable attention is being, or has been, given to these effects by the various engineers who are working on the problem, and I was given to understand that very shortly some very interesting disclosures would be made as a result of their work.



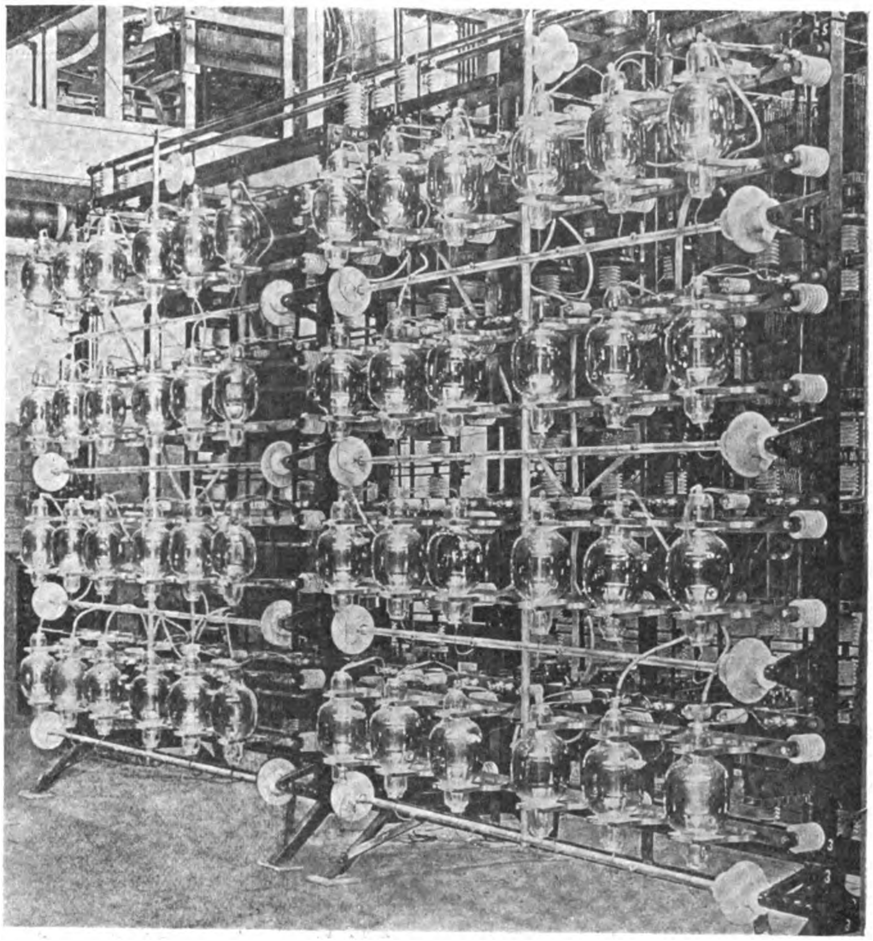
Circuit diagram of four-element vacuum tube

The antenna system used at Southwald for the transmitter is located between 300 and 400 feet from the receiving antenna. It consists of a metal mast about 80 feet in height supported on an insulator at a point approximately three feet above the ground. The mast is held in position by four sets of tarred rope guys and itself acts as the antenna. Radiating from its base at a height of about two feet is the counterpoise system, or, as the British call it, the "earth.

shield." Thus an antenna having a fundamental wavelength slightly under 100 meters is provided. For reception, various types of antenna have been tried including modifications of the Beverage-Rice antenna used at Ardrossan in connection with the trans-Atlantic tests.

H. J. Round is mainly responsible for the "heavy" work in connection with the tube development, and the very interesting practical applications of these tubes. His grasp of the problems presented to the radio engineer and the sometimes startling practicality of his methods are a delight to the radio enthusiast. Many American engineers agree that his long years of experience with radio in all parts of the globe and under all possible conditions have rendered him, without doubt, the most versatile radio engineer in the game. About five feet eight inches in height and in his early forties, clean shaven and of youthful bearing, he has the habit when thinking, of pacing the floor, hands in pocket and head bowed. Round is very sure that large high-frequency alternators have had their day. He is certain that no more will be built for use in Europe, and points with considerable and quite pardonable pride to the functioning of the tube transmitters. These power tubes show a life of well over 2,000 hours. Round also has a hobby — it is photography. Who ever before heard of a radio man with a hobby?

Details concerning the work which has been done by C. S. Franklin of the Marconi company on wavelengths under ten meters was unavailable. It is to be expected that the radiation efficiencies at these wavelengths would be extremely high, and it is to be hoped that we may look forward to some accounts of this work within the near future.



48-Tube panel transmitter at Carnarvon, Wales. A unique cooling system consisting of rubber hose attached to the bases of the tubes through which air circulates permits operation at high powers. This set gave satisfactory service between England and Australia

Proposals for Regulating Radio

THE Technical Committee of the Washington Radio Conference in its report, made public on March 10, recommends a zoning system of wave lengths for various kinds of service, power limitation and fixed rules for geographical distribution, and defines the various types of stations and their services and also standardizes the nomenclature of radio.

It is proposed that allocation of wave lengths would give amateurs exclusive use of wave lengths from 150 to 275 meters. Sharing from 200 to 275 with technical and training school stations, Government, public and broadcasting stations would be given from 1,050 to 1,500 meters, and Government and public station 700 miles inland from 700 to 750 meters. Private and toll broadcasting (including newspapers) would have exclusive use of 310 to 435 meters.

In its resolution the technical committee recommends:

"That the radio laws be amended so as to give to the Secretary of Commerce adequate legal authority for the effective control of the establishment of all radio transmitting stations, except amateur, experimental and Government stations and of the operation of non-Governmental radio transmitting stations."

It also provides: "That it is the sense of the conference that radio communications is a public utility and as such should be regulated and controlled by the Federal Government in the public interest."

And that "the types of radio apparatus most effective in reducing interference should be made freely available to the public without restriction."

A summary of the preliminary report of the technical committee of the Radio Telephone Conference, prepared by Secretary Hoover, is as follows:

"The Radio Telephone Conference was divided some days ago into committees, of which one of the most important is the technical Committee, under the chairmanship of Dr. Stratton, S. W., director of the Bureau of Standards. This committee has now issued tentative recommendations as to methods and policies for radio telephone control.

"The committee puts its recommendations forward for consideration, and constructive criticism by interested organizations with a view to reassembling again in two or three weeks to reconsider such criticism. The recommendations are of great length and detail. They first point out the necessity for Government control of radio telephones as the only solution

(Continued on page 42)

WORLD WIDE WIRELESS

Big Four-Nation Radio Station

OWEN D. YOUNG, Vice President of the General Electric Company, on his way to Cannes, with Thomas N. Perkins of Boston, on a mission in connection with the activities of the Radio Corporation of America for the development of trans-Atlantic wireless communications between Europe and North and South America, gave interesting details concerning the various great European organizations which have now reached an agreement with regard to wireless transmission between Europe and South America. These are three, namely, the English Marconi Company, the French Compagnie de Telegraphie Sans Fil and the German Telefunken.

Each had planned to erect a station in South America sufficiently powerful to transmit to Europe. The American Radio Corporation had similarly planned a South American station for communication with the United States. Owing to the great distance and also to the fact that the Equator must necessarily be crossed it was essential that these stations should be of very great power. And the erection of the four stations in Argentina thus planned would have entailed what Mr. Young described as a "waste of waves which the world could not possibly afford." The volume of the messages transmitted, too, could not warrant this expenditure of money and energy.

Consequently Mr. Young, representing the Radio Corporation of America, came to Paris last October and called a meeting of representatives of the three European organizations in order to discuss what could be done. It was decided at this conference to build only one station in Argentina from which news will be transmitted by the various companies to their own several countries.

The accord was signed, patents were exchanged and decided to place control in the hands of nine trustees, each of the four companies involved naming two, while the ninth, acting as Chairman, will also be appointed by the Radio Corporation of America. Thomas N. Perkins was chosen to fill the post of Chairman. Meetings are now being called at Cannes in order to discuss further developments.

"It is not our intention," said Mr. Young "to compete with the cable companies for what I may describe as news of the more expensive kind, such as for instance, financial news and stock exchange messages. What we wish to do is to provide the cheapest possible form of general private communication. For example we are now building a great station at Warsaw. Well, I want to educate the public to make the same use of wireless as they now make of the telephone.

"The day will come when a Polish business man in the United States will flash a wireless to Warsaw asking how his wife and latest baby are getting on and whether that tooth is now through. And when communication between the various countries has reached that stage of development I think the world will be able to talk of general disarmament."

12-Year old Kenneth R. Hinman using his match box receiving set out in the woods

✦ ✦ ✦

Next Presidential Campaign by Radiophone

THE next Presidential campaign will be conducted largely by wireless telephone, Professor G. O. Aubrey, of Swarthmore Preparatory School, predicted in an address before the Radio Club at the school.

"Better acquaintance with the various candidates for the Presidency in 1924 is almost assured with the increasing use of the wireless telephone," said Professor Aubrey. "Voters, millions of them, most likely will hear the messages sent out by the candidates by wireless, for receiving sets will be found in homes and meeting places throughout the nation."

✦ ✦ ✦

Airplane Radio Sets Send and Receive

ONE of the airplanes of the Ninetieth Squadron, stationed at Kelly Field, Texas, has been specially fitted with radio equipment for transmitting and receiving, together with an SCR-72 amplifier.

Two generators are used, with a special changeover switch, which eliminates several articles as regularly installed with the service SCR-73 set. Two antennas are used, one for the transmitting set and one for the receiving. The operator can talk and receive messages at the same instant. The ship has been tested with the new high-power radiophone of the first wing with good results, although it has not been possible to make distance tests as yet. Radio music has been transmitted successfully from the ground to the plane at 4,000 feet.

✦ ✦ ✦

Russian Chain of Radio Stations

SOVIET Russia will soon have a wireless station capable of trans-Atlantic service, says H. Nikolaiev, Assistant Commissar for Posts and Telegraphs.

The station is in progress of erection at Bogorodsk, near Moscow, and is expected to be one of the most powerful in the world. Its towers will be more than 900 feet high, which is 300 feet higher than the famous German wireless station at Nauen. The new Russian station will have a strength of 500 kilowats.

Nikolaiev adds that Soviet Russia has made great progress in wireless communication in the last four years and cites as evidence of it the fact that the station at Moscow is able to hold telephone conversations with another at Chita, Siberia, 3,000 miles distant. Russia now has thirty-eight sending stations and 290 receiving stations.

New wireless stations will be erected within the next few months at Tashkent, Kharkov, and Novo-Nikolaevsk, as well as at the radial points of the Siberian water basin and along the Arctic sea coast, where nine stations were installed in 1921.

2,000 Saved by Radio Compass

THE Army Transport Cantigny, with 2,000 of the Fifth Infantry aboard, was in a storm off the coast March 21, with her compass out of commission and unable to get bearings until the radio compass came to her aid.

With the assistance of shore stations, which sent her bearings by wireless, the Cantigny was piloted to safety at Portland, Me.

Capt. Hitchcock of the Cantigny congratulated operators at Bar Harbor and Cape Elizabeth stations on their almost perfect compass bearings during the storm, which was "our only means of direction, for it was too dark for sights."

New Italian Station

THE new experimental wireless station eleven miles out of Rome was inaugurated on the twenty-fifth anniversary of the invention of wireless telegraphy by Guglielmo Marconi. Several Government officials attended the ceremony.

Signor Marconi sent a message regretting his inability to attend, as he is convalescing from pneumonia in London. He was represented by Marquis Luigi di Solari.

The new station received messages from Long Island, New Brunswick and San Francisco.

Leviathan Staterooms Equipped with Radiophones

THE steamship Leviathan, when she starts again in the trans-Atlantic service next year, will have a wireless telephone in every stateroom, Chairman A. D. Lasker says. The plans for the reconditioning of the huge liner, he said, call for the finest wireless equipment ever put on a passenger vessel.

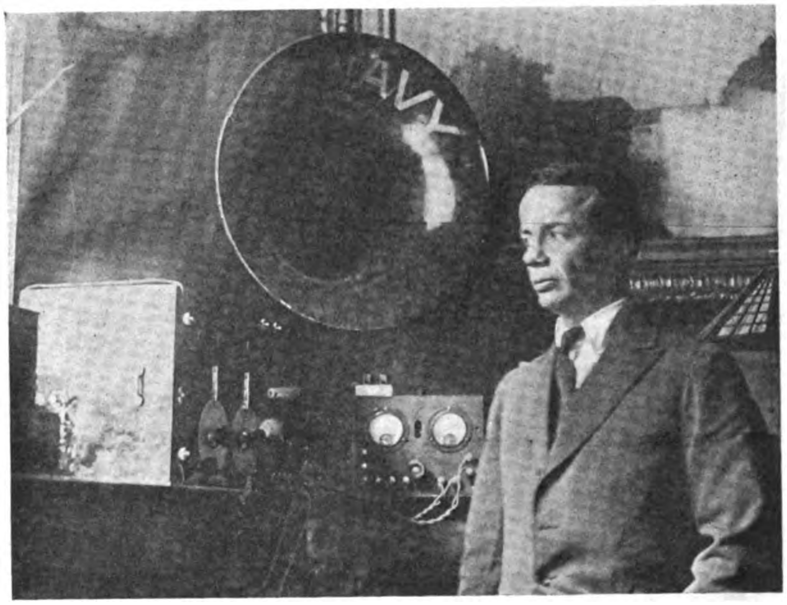
Dramatic Rescues Due to Direction Finder

THE wireless direction finder has been instrumental in effecting two dramatic rescues at sea. In each case by a strange coincidence the foundering ship was of Norwegian nationality, the captain's idea as to his position — arrived at by observation — was many miles out, with the result that several vessels were searching for him in the wrong direction, and the rescue took place at the "eleventh hour."

During the recent storms in the North Atlantic the Norwegian steamer "Mod" was so badly damaged that she became practically a wreck and for 36 hours the crew were huddled on deck without food. The captain sent out an SOS message giving what he believed to be his position but which proved to be erroneous. At least six vessels diverted their course in an attempt to render help but no trace of the Mod could be found. The George Washington searched for 15 hours and proceeded to three different positions without result.

For some time the British vessel Melmore Head was too far away to be of any assistance but the Captain kept in touch with what was happening, and when he found the Mod's signals getting stronger he directed the wireless operator to ascertain her position by means of his radio direction finding apparatus. According to the reading thus obtained the Mod was 78 miles away from the position she herself had sent out and sailing in an entirely different direction. The Captain of the Melmore Head placed his reliance in the direction finder and found it to be correct. He came up to the foundering vessel only just in time to save 23 members of the crew. The vessel sank almost immediately and ten men, including all officers, were drowned.

The earlier rescue took place in January, 1921, and was effected by another steamer of the Head Line under precisely similar circumstances. In this case the Fanad Head saved 31 members of the crew of the Norwegian steamer Ontaneda. The Captain of the "Ontaneda" estimated his position by dead reckoning which showed an error of 90 miles.



Assistant Secretary of the Navy Theodore Roosevelt has installed a receiving set in his home, and with his family enjoys the broadcasted concerts

Armstrong Upheld on Appeal

THE United States District Court of Appeals in an opinion by Judge Martin T. Manton and concurred in by Judges Rogers and Knox, affirmed the judgment of the United States District Court in the wireless patent litigation instituted by Edwin H. Armstrong of Yonkers, and the Westinghouse Electric and Mfg. Company, against the De Forest Radio Telephone and Telegraph Company.

The patent in question related to an amplifying system for the radiophone to increase the loudness of signals and sounds so that greater distances can be covered.

Amundsen to Use Radio on Arctic Trip

CAPTAIN Raold Amundsen sailed for New York recently on board the Stavangerfjord, having been in Norway three weeks in connection with his next expedition into the Arctic region, to begin about June 1. He is going to Seattle, where his steamship, the Maude, is being repaired.

The expedition is being supplied with a wireless outfit capable of covering a radius of 2000 miles. He expects to reach Wrangel Island in July.

Read what

Radio Corporation of America
233 Broadway
New York City

As the representative of the American Radio Relay league in England during the recent Trans-Atlantic Amateur Transmission Tests, I wish to call your attention to the assistance given by all members of your organization from whom assistance was asked, and the cheerful, wholehearted manner in which it was given.

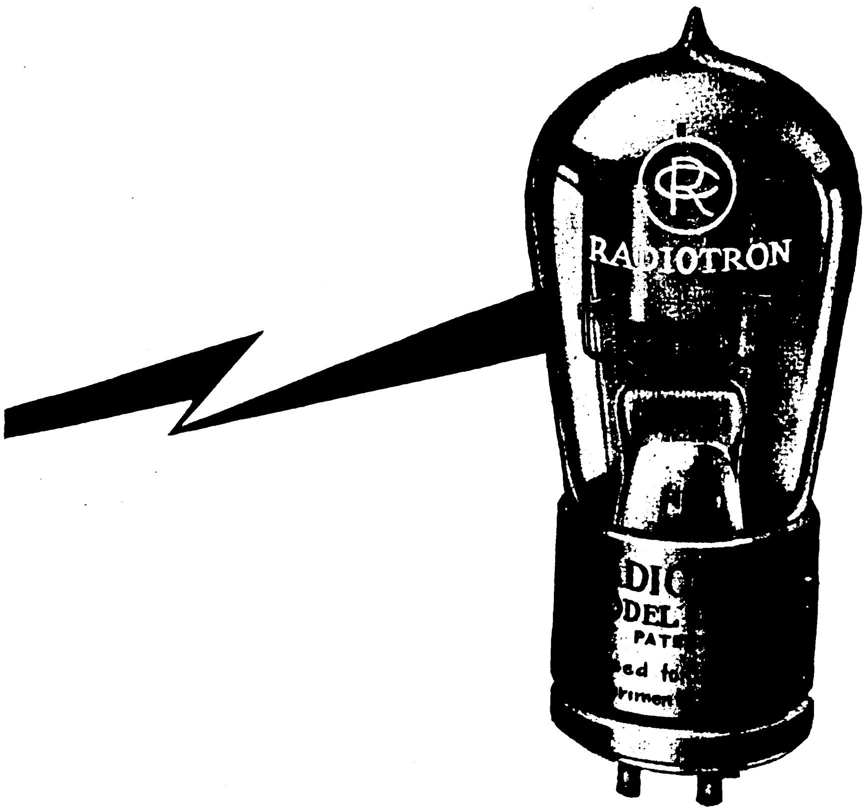
I have endeavoured, both in the written accounts of my experiences as well as in verbal reports of it, to point out the great value of this assistance, and to call attention to the fact that Radio Corporation Detector Tubes Type UV 200 were used during the reception at Ardrossan in conjunction with the regenerative receiver and 2-stage tone, frequency amplifier. These tubes functioned admirably, and the results obtainable was a surprise to the several British amateurs who saw them in operation.

All Radio Relay men with whom I have spoken concerning the matter since my return are deeply grateful for the co-operation given by your company, and fully appreciate that the completeness of the success of the venture would have been lacking in great degree but for your co-operation.

Respectfully,
Paul F Godley

Radio Corporation of America
WORLD WIDE WIRELESS
Sales Department, Suite 1801
233 Broadway, New York City

Godley says



It was a great triumph for the amateurs when they sent messages across the Atlantic to Scotland. But it was also a Radiotron triumph. Read what Paul F. Godley says in the letter here reproduced in facsimile. There are two Radiotrons available for reception. For Detection—Radiotron UV—200, the popular tube used by thousands of amateurs and novices because of its long life and super-sensitiveness. Price $5.

For Amplification—Radiotron UV—201, the amplifier tube which gives maximum amplification without distortion and which, like UV—200, is used throughout the nation for radiophone broadcasting reception. Price $6.50.

Ask your nearest Dealer for Radiotrons

Radio Corporation of America

WORLD WIDE WIRELESS

Sales Department, Suite 1801
233 Broadway, New York City

New York Hotel to Have Radiophones

ON March 23 Chief Magistrate W. G. McAdoo laid the cornerstone of the first hotel in New York City to be completely equipped with radiophones. Every room in this structure, The Sherman Square Hotel, which will be sixteen stories in height and covering the block front of Seventy-fourth street, from Amsterdam avenue to Broadway, will have the new invention at the disposal of guests.

* * *

Radio Saves Lives and Money

RADIO systems, strung along the coasts, saved untold lives last year besides rendering assistance to vessels valued at more than $66,000,000,000. The vessels assisted had on board at the times of mishap 14,013 persons besides 1,621 rescued by coast guard officers and enlisted men from water disaster.

Commander W. E. Reynolds, chief of the coast guard service, says perfection of the radio in life saving and in preventing ship disasters is one of the wonders of the age. The system consists of 2,240 miles of telephone lines made up of 1,800 miles of overhead line and 440 miles of cable. That much the layman comprehends. The rest he takes on trust. He knows that over these wires comes the call for help from vessels in distress and through them revenue cutters and other ships are sent to the rescue of precious lives. He knows that warnings are sent to vessels of storms and other impending dangers because such things are noted as matters of routine news in the papers and he knows that comparatively few lives are lost at sea these days because of this modern wonder—this system of communication, accepted as an every-day matter. The service, so valuable, is maintained by the United States Government.

* * *

Radio Beats Bookmakers

WILBER DUBA, a United States navy radio operator assigned to shore duty with the American Relief Administration, succeeded in "putting it over" on Vienna bookmakers, but he got himself in trouble doing it.

Owing to the difference in time between Vienna and Paris and the slowness of transmission, bookmakers at Vienna have been accepting bets upon horses after the races actually were run in Paris. From this situation, Duba developed a system of obtaining quick returns from the Paris races. He played bets in several ways to allay suspicion, taking care to plunge on "long shots." One win was on a 130 to 10 shot.

One of the bookmakers became suspicious. Duba was arrested, but was released upon parole when restitution was made. Another American was fined 10,000 crowns and a doctor's expenses for resisting being called a "schieber" (profiteer), which is an odius epithet in Vienna.

* * *

Yukon Wants Radio

CANADIAN legislators are making efforts to have the Government establish two powerful radio stations in the Yukon country, one at Dawson and the other at White Horse.

Influence is also being brought to bear in favor of opening other stations at Stewart, Atlin and Alice Arm, B. C., in opposition to a proposal to rebuild an abandoned telegraph line in that country.

Presidential Proclamation by Radio

PRESIDENT HARDING may broadcast a Presidential proclamation by radio telephone launching the Government's savings certificates campaign if plans being worked out by the Treasury and Post Office Departments are carried out.

* * *

Oil Prospectors Use Radio in the Orient

WHEN the Canadian Pacific "Empress of Asia" sailed from Vancouver recently for the Orient she carried in her hold a shipment of wireless equipment made up of a number of sets of instruments which are to be used by oil prospectors for one of the large companies now endeavoring to locate oil fields in the Orient. Lack of transportation facilities and means to get information from one point to another in the Orient has forced the larger concerns to use wireless telephones as a means of communication.

* * *

The "Baltic's" Remarkable Record

A REMARKABLE achievement in ship-to-shore wireless working is reported by the White Star liner Baltic. Every night throughout her recent voyage from New York to Liverpool she was in direct communication with the Radio Corporation's station at Chatham, Massachusetts. Messages were actually exchanged while the vessel was anchored at the Liverpool Bar when over 3,000 miles separated the two stations.

The Baltic was using her standard tuner and four-electrode detector, the regulation circuits being unaltered.

Proposals for Regulating Radio

(Continued from page 37)

to the present chaos of interference; that unless there is definite regulation of all telephone transmitting stations the whole system will be destroyed by interference.

"In order to accomplish this the committee recommends that the existing powers of the Department of Commerce should be extended to complete control of transmitting stations. Below 6,000 meters should in a general way be reserved for radio telephone service, but those wave lengths which have become fixed in service for telegraph service within this range, such as SOS signals shall be retained. But it is the hope and expectation that the radio telephone may ultimately keep the whole range from zero to 6,000 meters.

Broadcasting Classification

"The committee considers that the present development of the art warrants the separation of twenty different wave bands within this range, of which seventeen, lie between zero and 2,000 meters. In the assignment of these wave bands the committee recommends that priority first be given to broadcasting service and that secondarily broadcasting service itself should be divided into priorities in the following rotation: First, government broadcasting; second, educational and public broadcasting; third, private broadcasting, including entertainment, news, etc., and fourth, toll broadcasting.

Reservation of wave lengths between 150 and 275 is made for amateurs and some opportunity in experimental wave length would be assigned to them in addition. The committee recommends that amateurs shall police themselves as to division of their wave bands between different varieties of amateur work. The committee recommends in addition to the establishment of wave bands for different services in various priorities that it is also necessary to limit the amount of power used in transmitting stations, thus limiting each of them to some special zone in order to further limit interference and enable a wider variety of wave lengths to be assigned to different localities.

"The committee also recommends that the time of day occupied by different transmitting stations for different services should be placed in control.

"The conference strongly recommends the extension of authority of the government into thorough control of transmitting stations for different services, and that the radio telephone may not be considered a public utility.

"Broadcasting" Is Defined

"'Broadcasting' signifies transmission to an unlimited number of receiving stations without charge at the receiving end. 'Government broadcasting,' signifying broadcasting from public institutions, including State Governments, political subdivisions thereof and universities and such others as may be licensed for the purpose of disseminating news, entertainment and other service, and 'toll broadcasting' signifying broadcasting by a public service radio telephone company as a paid service.

"The restricted special amateur wave of 310 meters is for use by a limited number of inland stations and only where it is necessary to bridge large, sparsely populated areas or to overcome natural barriers.

"It is recommended that the Secretary of Commerce assign a specific wave length to each radio telephone broadcasting station (except Government and amateur stations), this, of course, being within the band pertaining to the particular service of that station.

"It is recommended that the wave band assigned to amateurs, 150 to 275 meters, be divided into bands according to the method of transmission, damped wave station being assigned the band of lowest wave lengths; interrupted or modulated continuous wave radio telegraph stations the next band; radio telephone stations the next band, and, finally, unmodulated continuous wave radio telegraph stations to carry on within the wave lengths assigned by the Secretary of Commerce to amateur radio telephony.

"It is recommended that in cases where congestion of radio telephone broadcasting traffic exists, or threatens to exist, the Secretary of Commerce assign suitable hours of operation to existing or proposed private and toll broadcasting stations."

The general system of allocation of wave lengths recommended by the Committee is as follows:

Trans-oceanic radiophone experiments, non-exclusive—5,000 to 6,000 meters.

Fixed service radio phone, non-exclusive—2,850 to 3,300 meters.

Mobile service radio phone, non-exclusive—2,500 to 2,650 meters.

Government broadcasting, non-exclusive—1,850 to 2,050 meters.

Fixed station radio phone, non-exclusive—1,550 to 1,650 meters.

Aircraft radio phone and telegraphy, exclusive—1,500 to 1,550 meters.

Government and public broadcasting—1,050 to 1,500 meters.

Radio beacons, exclusive—950 to 1,050 meters.

Aircraft radio phone and telegraphy, exclusive—850 to 950 meters.

Attending the Radio Regulation Conference at Washington. Left to right, front row—Sec. of Commerce Herbert Hoover, Mr. Will Hays, Maj.-Gen. Geo. O. Squier, Congressman W. H. White, former Congressman S. Sherley. Back row—Dr. Louis Cohen, Prof. C. M. Jansky, Jr., Edwin H. Armstrong, Harry F. Breckel, Dr. Alfred N. Goldsmith

Radio compass, exclusive—750 to 850 meters.

Government and public broadcasting, 700 miles inland—700 to 750 meters.

Mobile radio phone, non-exclusive—650 to 750 meters.

Mobile radio telegraphy, exclusive—525 to 650 meters.

Aircraft radio phone and telegraphy, exclusive—500 to 525 meters.

Private and toll broadcasting, exclusive—310 to 435 meters.

Restricted special amateur radio phone, non-exclusive—310 meters.

City and State public safety broadcasting, exclusive—275 to 285 meters.

Technical and training school, (shared with amateur)—200 to 275 meters.

Amateur (exclusive) 150 to 200 meters; amateur (shared with technical and training schools), 200 to 275 meters.

Reserved—below 150 meters.

The detailed recommendations of the Committee are as follows:

Power Limitation, Geographical Distribution

(a) It is recommended that the Secretary of Commerce assign to each radio telephone broadcasting station a permissible power based on the normal range of the station, such normal ranges for the different classes of service to have the following average values, larger or smaller values being discretionary where conditions warrant:

Government broadcasting station, 600 (land) miles.

Public broadcasting stations, 250 miles.

Private and toll broadcasting stations, fifty miles.

(b) It is recommended that the same wave (or overlapping wave bands) not be assigned to stations within the following distances from one another, except that these distances may be lowered if the normal ranges of the stations are correspondingly lowered:

For Government broadcasting stations, 1,500 miles.

For public broadcasting stations, 750 miles.

For private and toll broadcasting stations, 150 miles.

(Note—The Bureau of Standards should make a study of the width of wave band —expressed in cycles per second—required for satisfactory radio telephony. It is recognized that this width depends on the methods of transmission and reception employed).

(c) It is recommended that the Secretary of Commerce cause an immediate study to be made of the best geographical distribution of broadcasting stations with the view of attaining the best service with a minimum of interference.

(d) It is recommended that in cases where congestion of radio telephone broadcasting traffic exists, or threatens to exist, the Secretary of Commerce assign suitable hours of operation to existing or proposed private and toll broadcasting stations.

Granting of Station Licenses

(a) It is recommended that in the case of conflict between radio communication services first consideration be given to the public not reached, or not so readily reached, by other communication services.

(b) Subject to public interest and to the reasonable requirements of each type of service the order of priority of the services shall be government, public, private, toll.

(c) It is recommended that the degree of public interest attaching to a private or toll broadcasting service be considered in determining its priority in the granting of licenses, in the assignment of waves, and in the assignment of permissible power, within the general regulations for these classes of service.

(d) It is recommended that toll broadcasting service be permitted to develop naturally under close observation, with the understanding that its character, quality and value to the public will be considered in determining its privileges under future regulations.

(e) It is recommended that direct advertising in radio broadcasting service be not permitted and that indirect advertising be limited to a statement of the call letters of the station and of the name of the concern responsible for the matter broadcasted, subject to such regulations as the Secretary of Commerce may impose.

(f) It is recommended that when all available wave bands in any geographical region are already assigned, no further licenses for broadcasting be granted in that region until cause arises for the revocation of existing licenses.

(g) It is recommended that private or toll broadcasting stations transmitting time signals shall transmit only official time signals and with authorization from and under conditions approved by the Secretary of Commerce.

(h) It is recommended that the transmission of signals of such character or wave length as to deliberately interfere with the reception of official time signals constitutes grounds for the revocation of the transmitting license.

(i) It is recommended that license requirements for the operator of a radio telephone transmitting station include a knowledge of the International Morse Code, sufficient to receive at a rate of not less than ten words per minute.

Reduction of Interference

(a) It is recommended that the Secretary of Commerce at his discretion prohibit at any time the use of existing radio transmitting apparatus and methods which result in unnecessary interference, provided that such action should not be taken unless more satisfactory apparatus and methods are commercially available at reasonable prices and until an adequate time interval is allowed for the substitution of the more satisfactory apparatus.

(b) It is recommended that the Secretary of Commerce at his discretion prohibit at any time the use of existing radio receiving apparatus which cause the radiation of energy, provided that such action should not be taken unless more satisfactory apparatus and methods are commercially available at reasonable prices and until an adequate time interval is allowed for the substitution of the more satisfactory apparatus.

(c) It is recommended that the Bureau of Standards make a study of the technical methods for the reduction of interference, with a view to publishing their findings, giving special attention to the following:

1. The reduction of the rate of building up (increment) of oscillations in radiating systems. (This rapid building up of oscillations occurs in damped wave and interrupted continuous wave transmitters, and may, of course, be eliminated by the substitution of other types of transmitter. It may, however, be reduced in these types by proper circuit arrangements).
2. The reduction of harmonics in continuous wave transmitters and of irregularities of oscillation ("mush" in arc transmitters and "swinging" of the frequency in all types of continuous wave transmitters not employing a master oscillator).
3. The comparison of the variable amplitude method with the variable frequency method of continuous wave telegraphy.
4. The preferable methods of telephone modulation to avoid changes in the frequency of oscillation.
5. The proper circuit arrangements of regenerative (including oscillating) receivers to avoid radiation of energy (as by the use of radio-frequency amplifier with an untuned antenna or with a coil aerial).
6. The use of highly selective receiving apparatus, including a list of improved forms
7. The use of receiving coil aerials instead of antennas, with special reference to high selectivity.
8. The reduction of interference with radio communication of other electrical processes, such as the operation of X-ray apparatus and electrical precipitation.
9. The study and standardization of wave meters.

Recommendations on Nomenclature

1. In place of the word "wireless" and names derived from it, use the prefix "radio"—radio telegraphy, radio telephony.

2. Instead of "statics" or "X's," use "atmospheric disturbances" or "atmospherics."

3. Disturbances produced by other stations to be designated as "interference."

4. For the generic title of the vacuum tube, of any number of electrodes, and in any of its recognized modes of operation, use "electron tube."

For the specific title of the ordinary three-electrode tube use "triode."

For the title of a triode employed in one of its regular modes use "rectifier triode," "amplifier triode," "generator triode."

5. In describing coupling of high-frequency circuits use "resistance coupling," "inductive coupling" (by self-inductance or mutual inductance), "capacity coupling."

6. For the generic title for a system of conductors for radiating or absorbing radio waves use "aerial." For an open circuit aerial use "antenna." For a closed circuit aerial use "coil."

7. For a receiving arrangement in which beats are produced by a separate local oscillator, use "heterodyne." For a receiving arrangement in which the same electron tube is used for generating oscillations and detecting, use "self netro."

8. Classification of waves emitted by radio transmitters.

Type A—Continuous waves: Waves that in the permanent state are periodic and such that their successive amplitudes of oscillations are identical.

Type A-1—Manipulated continuous waves: Continuous waves of which the amplitude or frequency vary under the action of hand telegraphic manipulation.

Type A-2—Continuous waves with audible frequency modulation: Continuous waves of which the amplitude or the frequency vary according to a periodic law of audible frequency. This is commonly referred to as ICW method of transmission.

Type A-3—Continuous waves with speech modulation: Continuous waves of which the amplitude or the frequency vary in accordance with speech vibrations (radio telephony).

Type B—Damped waves.

Waves composed of successive trains in which the amplitude of the oscillations after having reached a maximum decreases gradually. This refers to waves from spark transmitter or other types of transmitters having a characteristic decrement similar to spark transmitters.

Note 1—If in continuous wave transmitters the rectified plate voltage is not substantially constant direct voltage, the station should be classed under Type A-2.

Note 2—In ICW transmitting stations if the variation in the wave length or frequency of the transmitted wave is effected in a gradual wave (sinusoidally) the station should be classed under Type A-2. If the variation in frequency or amplitude is abrupt (chopper method) it should be classed in Type B.

In order to differentiate between the amateur and the experimenter the following definitions are suggested for consideration.

The amateur is one who operates a radio station transmitting, receiving, or both, in a professional way, merely for personal interest or in connection with an organization of like interest.

An experimenter is one who operates a transmitting or receiving station, or both, for exclusively technical or scientific investigations.

Talks From Office to Ship

For the first time in the history of maritime radio, docking instructions were given verbally to the captain of a big trans-Atlantic liner by the manager of the line, seated in his office in New York while the ship was 360 miles at sea. This pioneer work in radio communication was accomplished by utilizing one of the latest developments of radio engineering, duplex radiotelephony, in conjunction with the usual land-line telephone.

While the America of the United States lines was 360 miles east of New York on the evening of March 5, Thomas H. Rossbottom, general manager of the S. S. lines, picked up the ordinary telephone on his desk and asked central to connect him with the S. S. America, at sea. His line was connected through to the Deal Beach, N. J., station, and thence by radio to the ship.

Thomas H. Rossbottom, General Manager of the U. S. Lines, talking by wire and radio to Capt. Rind of the S. S. America, 360 miles out at sea

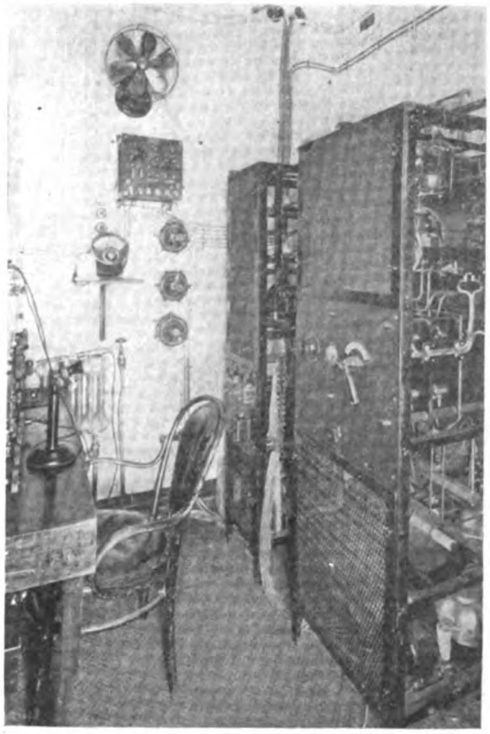
Within ten minutes after the call was made Captain William Rind, of the America, was on the telephone. After an exchange of greetings, Captain Rind told Mr. Rossbottom the speed he was making, and the time he expected to reach Quarantine. Mr. Rossbottom in reply gave his instructions to Captain Rind concerning the special arrangements which had been made with the Public Health officials at the Quarantine station for the passing of the vessel after the sunset hour.

Mr. Rossbottom and Captain Rind conversed for several minutes. Mr.

Rossbottom, using the telephone at his desk, the one that is normally used in his daily business, and without any special appliances.

The interesting feature of a shipboard duplex installation is the fact that the antenna is being used to radiate several hundred watts of power while at the same time the radio receiver detects and makes audible the extreme amount of energy that is being picked up from the distant transmitting station. Much research has been done to allow this simultaneous transmission and reception to be carried on and a ship equipped with apparatus of this nature may communicate to any subscriber on land who has an ordinary telephone in his home.

Radio telephony, heretofore limited to a single operation — reception or transmission — has been revolutionized as a result of these tests. Up to this time the radio telephone has been handicapped by conditions similar to those of the ordinary apartment house speaking tube. It has been necessary for the operator to throw a switch when he desired to talk after listening, or vice versa. This prevents a land-line telephone from being linked up with the radio telephone system, as it is not practical to provide a control or "send-receive" switch at each land phone.



Duplex radio telephone equipment on the S. S. America

With the advent of the duplex wireless equipment, however, a conversation may be carried on through the ether as simply and as naturally as between land telephones.

The equipment installed on the America consists of three main units — the Kenotron or power panel, the vacuum tube transmitter and the radio receiver. Power is supplied to the Kenotron panel in the form of low-voltage alternating current and after passing through the various pieces of apparatus comes out in the form of direct current at a very high voltage.

This high voltage is fed into the radiotron power tubes, where it is transformed into radio-frequency energy. Other radiotron tubes are used to control, or modulate, the high-frequency current.

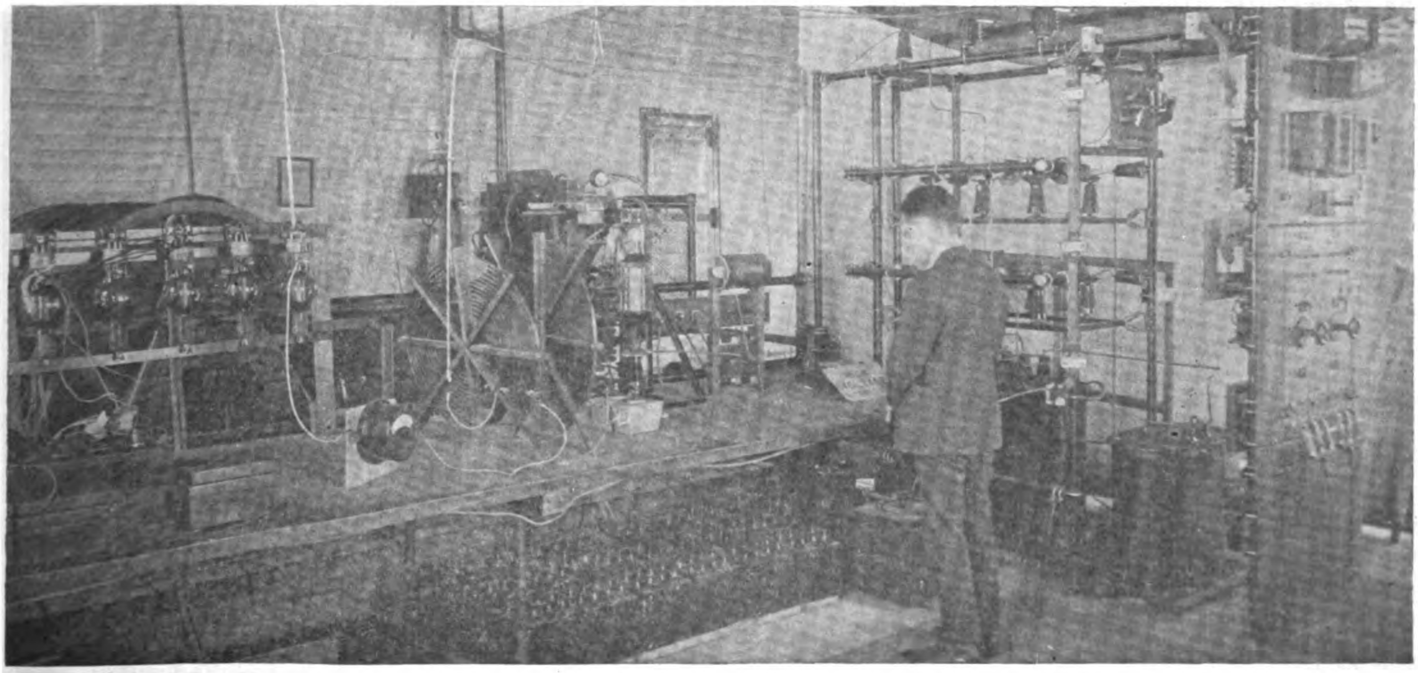
General Electric Broadcasting Station WGY

A RADIO broadcasting station, more powerful than any now sending out programs, has been installed by the General Electric Company at its plant in Schenectady, N. Y.

From the roof of a five story factory building, two towers 183 feet high and spaced 350 feet apart, support an antenna at such height as to give the wireless waves unobstructed freedom to travel equally well in all directions.

This station has not been regularly operated nor has advance announcement been made of the impromptu or test programs sent out, which would cause amateurs to be listening, yet, letters have been received from such distant points as Cedar Rapids, Iowa, Minneapolis and Santa Clara, Cuba, the latter place 1450 miles distant, announcing that the programs have been heard. These reports come from operators who, in an evening's experimenting with their receiving sets, have accidentally come upon the waves from Schenectady and is in no way an indication of the full distance that this station may be heard.

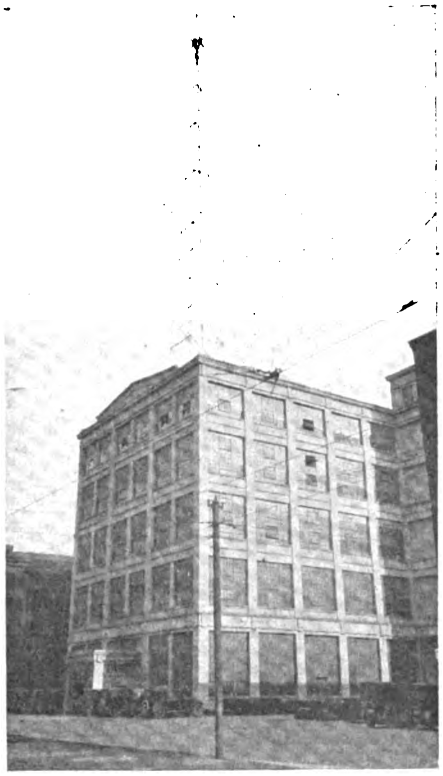
Broadcasting stations, with but a fraction of the power of the G-E sta-



Interior of transmitting room in W G Y, the General Electric Co. radio broadcasting station located at Schenectady, N. Y. View shows control panel at right and oscillator and modulator tubes at left tion, have been heard at distances of 2,000 miles or more under favorable atmospheric conditions.

The General Electric station has been licensed to operate on a 360 meter wave length under the call letters of WGY. It is equipped with the most modern of radio apparatus, including the multiple-tuned antenna which, because of its many advantages, has been installed in Radio Central, the world's most powerful commercial station at Rocky Point, L. I., and other transoceanic stations of the Radio Corporation of America.

A three-room studio, where the programs are produced, is located in a Company office building, 3000 feet from the transmitting station. One room is used as a reception room for the artists, where they may sit and chat until their time on the program arrives without danger of interfering with what is going on in the studio. The second room is the studio, where a concert grand piano, victrola, an organ and other equipment for the artists are to be found. Here a number of portable microphones, which are commonly known as pick-up devices can be shifted about to locations best suited for the reception of announcements, musical numbers, or whatever may be sent out. In the room on the opposite side of the studio is apparatus for amplifying the sound waves before they are transmitted by wire to the broadcasting station.



One of the 183-foot towers at WGY

A red light when the station is in operation warns persons in the room that whatever they might say will be sent out to thousands of ears of an invisible audience. A switchboard in the studio is within reach of the studio director at all times. Not until he throws a switch can anything reach the antenna. A telephone attached keeps him constantly informed just how the program is going out and enables him to change the position of the artist or microphone to improve the tone quality of the entertainment. With the exception of the small pick-up devices or microphones and the switchboard, there is nothing in this room to indicate it as being different from any musical studio.

In the apparatus room, the sound waves are put through a number of steps of amplification by means of vacuum tubes which increases their volume thousands of times. The amplified sounds are then put into a wire and sent to the broadcasting station, where they enter another bank of vacuum tubes, known as modulators or moulders of the electric waves.

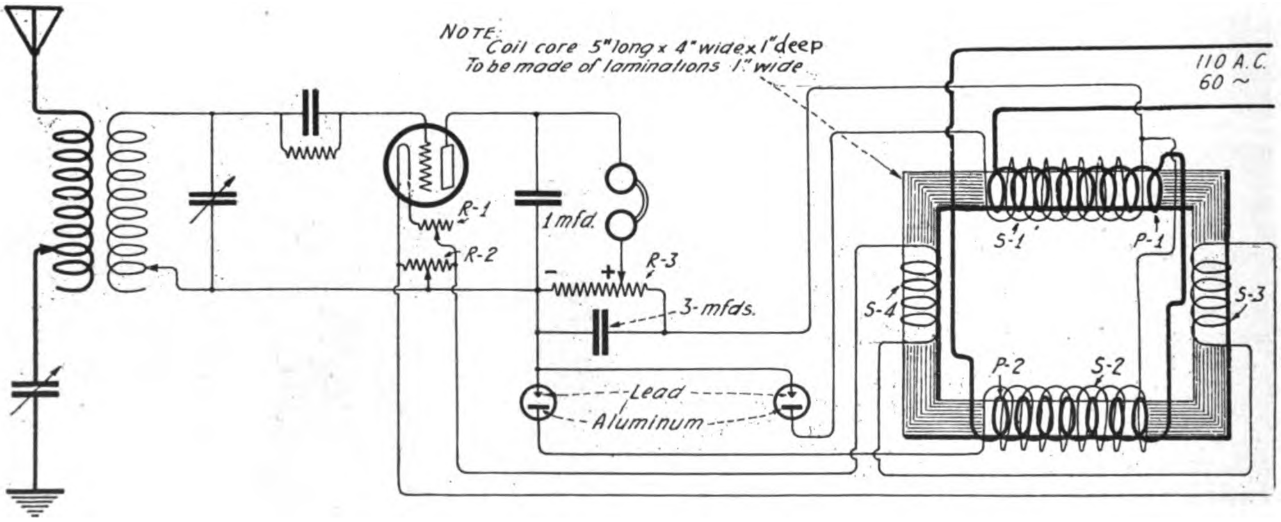
A 220-volt alternating current line, which is but little higher than the voltage used for lighting purposes in the home, is boosted to 30,000 volts by means of a transformer. This voltage is then applied to a number of vacuum tubes, acting as rectifiers, which change the voltage to direct current. Placed between the rectifier and the modulator or moulding tubes, is a high power oscillator tube. The electric power entering this tube sets the ether into vibration and upon these vibrations the electric waves, moulded into shape in the modulator tubes, are sent to the antenna to go out into space.

Alternating Current for Filament and Plate

THERE has come to the editors of this magazine during the last month, many inquiries requesting a fuller and more complete explanation of the "first prize" article entitled "Filament and Plate Current Direct from A.C. Supply," in THE WIRELESS AGE prize contest for the month of March 1922, with opinions as to its practicability and utility to both the experimenter and the layman.

Though this method is very satisfactory to the amateur who has the necessary knowledge as to the theoretical operation of the circuits, it is probable that the average layman will experience some difficulty in securing such adjustments as will give him complete satisfaction in the results obtained.

It seems, however, that this method is the logical solution for quite a few of the items of expense in connection with the average receiving outfit, and if anyone is blessed with a small amount of patience and a knowledge



Circuit diagram for filament and plate current supply from A. C. source

(Continued on page 55)

RADIOPHONE BROADCASTING

Texas Radio Market News

PLANS to install daily agricultural market news for Texas by radiophone, have been completed by officials of the State Department of Agriculture, State Department of Markets and Warehouse, the University of Texas and the Federal Bureau of Markets and Crop Estimates, Washington, D. C.

The necessity for a general diffusion of reliable information is evidenced by a growing public desire from all trades and professions, manifested in the great number of constant inquiries and requests received daily by State officials for information.

"Listening in" at the corner storekeeper's

Since radio news broadcasting has been demonstrated as efficient, economic and instantaneous, it has been decided to put on the market service in a moderate way. The service will be known as the "Texas Radio Market News Service."

Daily market reports will be obtained from the central markets of the country through the Kansas City office of the United States Bureau of Markets and Crop Estimates and from other sections of the country through other agencies. The data will be collected by the State Department of Agriculture, compiled by the State Markets and Warehouse Department, and disseminated by the University of Texas. The news will be broadcasted through the university high-power radio station daily.

Broadcasting Stations

KYW—360 meters. Daily, 8 P. M. Central time, 9 P. M. eastern time. Westinghouse Station located at Chicago, Ill.

KDKA—360 meters. Daily, 8 to 10 P. M. Westinghouse Station located at East Pittsburgh.

WBZ—360 meters. Sundays, Mondays, Wednesdays and Fridays, 8 P. M. Westinghouse Station located at Springfield, Mass.

WNO—360 meters. Evenings 10.30 o'clock. Jersey Journal station located at Jersey City, N. J.

WGI—360 meters. Evenings. American Radio and Research Corporation station located at Medford Hillside, Mass.

WGY—360 meters. No schedule. General Electric Co. station located at Schenectady, N. Y.

WJZ—360 meters. Daily, 11 A. M. to 10 P. M. Radio Corporation-Westinghouse Station located at Newark,

WVP—1450 meters. Evenings 9 to 9.55 o'clock, except Sundays and Holidays. Signal Corps, Bedloe's Island, New York Harbor.

Stations Broadcasting Music and Speech on 360 Meters

KDN	Leo J. Meyberg Co.	San Francisco, Calif.
KGB	Edwin L. Lorden	San Francisco, Calif.
KGC	Electric Lighting & Supply Co	Hollywood, Calif.
KGF	Pomona Fixture & Wiring Co.	Pomona, Calif.
KFC	Northern Radio & Electric Co	Seattle, Wash.
KFU	The Precision Shop	Gridley, Calif.
KHQ	Louis Wasmer	Seattle, Wash.
KIZ	Reynolds Radio Co.	Denver, Colo.*
KJJ	The Radio Shop	Sunnyvale, Calif.
KJQ	C. O. Gould	Stockton, Calif.
KJR	Vincent I. Kraft	Seattle, Wash.
KLB	J. J. Dunn & Co	Pasadena, Calif.
KLP	Colin B. Kennedy Co.	Los Altos, Calif.
KLS	Warner Bros.	Oakland, Calif.
KOG	Western Radio Electric Co.	Los Angeles, Calif.
KQL	Arno A. Kluge	Los Angeles, Calif.
KUO	The Examiner Printing Co	San Francisco, Calif.
KVQ	J. C. Hobrecht	Sacramento, Calif.
KWG	Portable Wireless Telephone Co	Stockton, Calif.
KYY	The Radio Telephone Shop	San Francisco, Calif.
KYJ	Leo J. Meyberg Co.	Los Angeles, Calif.
KZM	Preston D. Allen	Oakland, Calif.
KZY	Atlantic-Pacific Radio Supplies Co	Oakland, Calif.
WBU	City of Chicago	Chicago, Ill.
WCJ	A. C. Gilbert Co	New Haven, Conn.
WCR	L. Bamberger & Co	Newark, N. J.
WDM	Church of the Covenant	Washington, D. C.
WDT	Ship Owners Radio Service	New York, N. Y.
WDW	Radio Construction & Electric Co.,	Washington, D. C.
WFO	The Rike Kumler Co.	Dayton, O.*
WGH	Montgomery Light & Water Power Co	Montgomery, Ala.*
WGL	Thomas F. J. Howlett	Philadelphia, Pa.
WHA	University of Wisconsin	Madison, Wis.*
WHK	Warren R. Cox	Cleveland, O.
WHQ	Rochester Times Union	Rochester, N. Y.*
WHU	William B. Duck Co	Toledo, O.
WHW	Stuart W. Seeley	East Lansing, Mich.*
WJH	White & Boyer	Washington, D. C.
WJK	Service Radio Equipment Co	Toledo, O.
WJX	DeForest Radio Telep. & Teleg. Co.	New York, N. Y.
WLB	University of Minnesota	Minneapolis, Minn.*
WLK	Hamilton Mfg. Co.	Indianapolis, Ind.
WLW	Crosley Mfg. Co.	Cincinnati, O.
WMH	Precision Equipment Co.	Cincinnati, O.*
WOC	Karlowa Radio Co.	Rock Island, Ill.*
WOH	Hatfield Electric Co.	Indianapolis, Ind.
WOQ	Western Radio Co.	Kansas City, Mo.*
WOK	The Pine Bluff Co.	Pine Bluff, Ark.
WOU	Metropolitan Utilities District	Omaha, Nebr.*
WOR	L. Bamberger & Co.	Newark, N. J.
WOS	Missouri State Marketing Bureau	Jefferson City, Mo.*
WOZ	Palladium Printing Co.	Richmond, Ind.*
KQV	Doubleday-Hill Electric Co	Pittsburgh, Pa.
KQW	Charles D. Herrold	San Jose, Calif.
WRK	Doron Brothers Electric Co	Hamilton, O.
WRL	Union College	Schenectady, N. Y.
WPB	Newspaper Printing Co.	Pittsburgh, Pa.
WSZ	Marshall-Gerken Co.	Toledo, O.*
WWJ	The Detroit News	Detroit, Mich.*

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* Stations broadcasting market and weather reports on 485 meters in addition to music on 360 meters.

Radio Broadcasting Surveyed

By William H. Easton, Ph. D. (Westinghouse Elec. & Mfg. Co.)

APPARENTLY the first person to conceive of the transmitting of music from distant concert halls to the home was Edward Bellamy. In his famous book, "Looking Backward," which was written in 1887, to describe conditions that would exist in the year 2000, is the following interesting passage:

Edith Leete, the heroine, has invited Julian West (the victim of the strange mesmeric accident that sent him to sleep for 113 years) to hear music produced by ultra-modern methods.

This New MINTER Radio Bungalow $1950

Erected Complete Within Reasonable Distance of New York City

There's a delightful treat awaiting the owners of *Minter-Radio* Bungalows. Get away from the city this Summer, yet "listen [illegible] radio outfit includes amplifier, and will cover a radius of [illegible] to 500 [illegible] with [illegible]

Radio bungalows are now in style

"I was prepared for new devices in musical instruments," says West, "but I saw nothing in the room which by any stretch of the imagination could be conceived as such. It was evident that my puzzled appearance was affording intense amusement to Edith.

" 'Please look at today's music,' she said, handing me a card, 'and tell me what you would prefer. It is now 5 o'clock, you will remember.'

"The card bore the date Sept. 12, 2000, and contained the longest programme of music I had ever seen. I remained bewildered by the prodigious list until Edith's pink finger-tip indicated a particular section of it, where several selections were bracketed with the words '5 P. M.' against them; then I observed that this prodigious programme was an all-day one, divided into twenty-four sections answering to the hours. There were but a few pieces of music in the '5 P. M.' section, and I indicated an organ piece as my preference.

"She made me sit down comfortably, and, crossing the room, merely touched one or two screws, and at once the room was filled with the music of a grand organ anthem. I listened, scarcely breathing, to the close.

" 'Grand!' I cried, as the last great wave of sound broke and ebbed away in silence. 'Bach must be at the keys of that organ; but where is the organ?'

"'Wait a moment, please,' said Edith, 'I want to have you listen to this waltz before you ask any questions. I think it is perfectly charming;' and as she spoke the sound of violins filled the room with the witchery of a summer night. When this had also ceased, she said, 'There is nothing in the least mysterious about the music, as you seem to imagine. It is not made by fairies or genii, but by good, honest, and exceedingly clever human hands. There are a number of music rooms in the city perfectly adapted acoustically to the different sorts of music. These halls are connected by telephone with all the houses of the city whose people care to pay the small fee.'"

A masterly prophesy, but truth is far stranger than fiction. What would Bellamy have said if told that the concerts he foretold would be realities in 1922, but that the music would be conveyed without wires or any other tangible medium; that the especially-equipped concert halls would be located in cities hundreds of miles apart; and that no fee whatever would be required of the listeners?

Today ethereal concerts can be heard by sensitive receivers in almost every part of the United States. The trapper in Canada and the rancher of Texas alike ask to be provided with the daily programmes of the various stations. More than 500,000 listening stations are in active operation; and since most of these accommodate the entire family and many have loud speakers that serve audiences of hundreds at a time, it seems certain that several million people are enjoying this novel form of entertainment and instruction every night.

What the future of the radio telephone will be it is impossible to say. The only invention it can be compared with is the printing press. Gutenberg certainly could not foresee what was going to happen to the world because it occurred to him to make books by means of separate types; nor have those engaged in developing radio telephone sufficient vision to know what will happen when the voice of a single person can instantly reach everyone in North America.

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Christy Mathewson Interested in Radio

CHRISTY MATHEWSON, famous Giant pitcher, has become interested indirectly in wireless telephones since his son, Christy, Jr., has installed both a receiver and sending outfit in their apartment at Saranac Lake, N. Y., where they listen to the "music in the air" sent out from Newark, Pittsburgh, Chicago and other points. He awaits with interest the sending of the news reports of the day, and he is looking forward with much interest to the opening of the baseball season, when he will be able to obtain the results almost immediately after they have happened.

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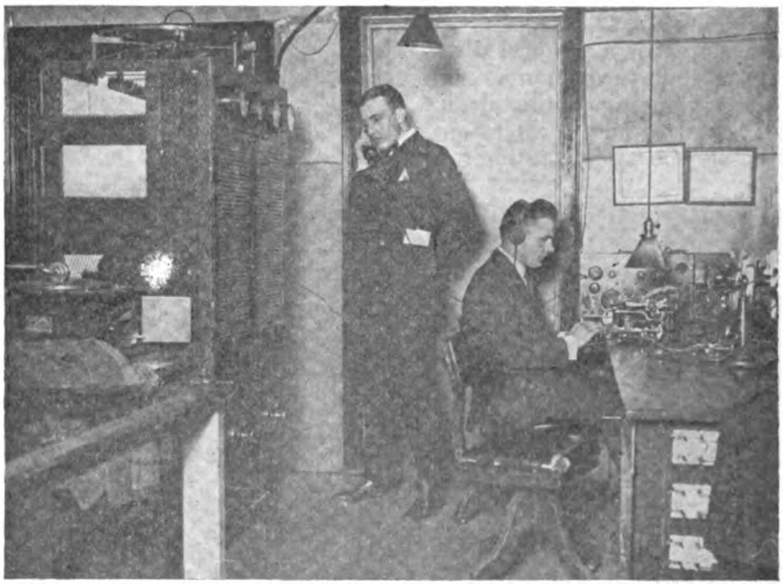
WGY "Listens Good"

WGY, the General Electric Radiophone Broadcasting Station at Schenectady, N. Y., has been heard in Minneapolis, 1,100 miles distant, and also in Santa Clara, Cuba, 1,450 miles away. The following cablegram was received from Cuba: "We danced new radio fox-trot last night. Send program. Wonderful reception."

Reports from other cities follow:



Interior of KYW, the Westinghouse broadcasting station located at Chicago

Minneapolis, Minn.—While feeling around for KDKA this evening, picked up your concert. I did not know it at the time as I thought I had KDKA, and you cannot imagine my surprise when I heard you make the announcement that you were WGY. I certainly enjoyed the concert very much. Came in very QSA. Modulation fine. I am using a short-wave variometer set, detector and one stage, but just had detector bulb lit as I did not need any more. I wish you would send me schedule of your concerts so I can get you again.—W. G. Peaslee.

Portland, Me.—In response to your request last evening from parties who heard your concert, the writer begs to state that same was received at Cape Elizabeth, Maine. The writer enjoyed the program very much and wishes to state that it was the clearest that I have received since I had the station in operation for the past month.—E. S. Lincoln.

Warren, Ohio—I was among your unseen audience last night and wish to say that we received your concert very plain and distinct.—Wm. C. Hein.

Springfield, Mass.—Your music and voice came in the best and clearest that we have ever received on second stage. Even the harmonics in The Son of the Puzzta of Keler Bela came in as clear and distinct as if you were playing in the room.—C. C. Waldron.

Hamilton, Canada—This is just to advise you that we heard part of the program last night very distinctly on the small receiving set my boy has. I presume that Hamilton is about 350 miles from your city. The violin solo by Mrs. Peter Smith was particularly clear and we heard the entire number from start to finish just as plainly as though it was being played in a room adjoining.—G. Allan.

Blissfield, Mich.—We appreciate concert which you gave us tonight. It came in splendidly and was one of the best ever received.—Ina Staup and Hazen Porter.

Pawtucket, R. I.—I had the pleasure of listening to the last two numbers of your concert last evening, and they were very enjoyable. The piano and violin I heard as plainly as if they were in the same room and were perfect as to modulation.—Fred W. Eaton.

Boothbay Harbor, Me.—The concert that your station gave out last evening was the most perfect toned and clearest that I have ever received, and I receive from five to seven stations a night. I use a Radiotron tube set that I have made. I entertained a small party of friends and also, by holding one of the receivers in front of the telephone, gave a concert to several people three or four miles away. They said that the piano sounded as clear as though it was in the next room. —Charles B. Dolloff.

Supply of Radio Apparatus

THERE has been considerable agitation recently over the supply of radio apparatus and requests have come from all quarters asking that the position of the Radio Corporation with reference to this condition, be defined,

The Radio Corporation of America is endeavoring in every way possible to meet the unprecedented demand for radio devices, including vacuum tubes, broadcasting receivers and other equipment, which has recently developed, not only on the part of the amateur and experimenter, but also on the part of a great many people who desire to equip their homes with suitable radio telephone devices for receiving music, concerts, lectures and other interesting features transmitted from radio telephone broadcasting stations.

Radio reduces the cares of Ma and Pa in this family

The factories of the General Electric Company and of the Westinghouse Electric and Manufacturing Company, which are manufacturing such devices for the Radio Corporation of America, are now operating on a greatly expanded production program, and it is expected that within the next few weeks considerable quantities of material will be shipped on orders already placed with the factories by the Radio Corporation. These will be delivered to customers as rapidly as received in the warehouse.

Distributors are requested to communicate the above information to dealers and to inform them that orders will be filled just as promptly as possible. This applies to all classes of radio apparatus, including Radiotrons, Vacuum Tubes, etc., which are employed for reception.

Radio broadcasting is here to stay. The great opportunities for the sale of radio devices can only be properly taken advantage of if all those who are interested in distributing and selling this apparatus, properly equip themselves to handle this class of merchandise in a satisfactory way. This means that the dealer or whoever is effecting the sale to the consumer, must familiarize himself with the product, explain its capabilities as well as its limitations and lend assistance in every way toward the proper installation and maintenance of radio sets.

Those who desire radio equipment and cannot for the moment obtain it, should be informed that the present shortage is but temporary and due entirely to the great demand which suddenly came as a result of broadcasting, and that the Radio Corporation and its associates, the General Electric Company and the Westinghouse Electric and Manufacturing Company, are doing everything in their power to produce the necessary apparatus with maximum speed; that normal production is expected to begin within the next few weeks and that deliveries will then be promptly made.

A new catalog covering all of the radio devices being manufactured for the Radio Corporation of America by the General Electric Company and the Westinghouse Electric and Manufacturing Company, is now in course of preparation and it is expected that it will soon be available for distribution.

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Secretary Denby "Listens In"

AMONG prominent officials in Washington who have private radio sets in their offices is Edwin Denby, Secretary of the Navy.

President Harding Greets Masons by Radiophone

THE resonant voice of Warren G. Harding, President of the United States, passed through the air between Washington and Utica, conveying his greetings and good wishes to the Utica Masonic Craftsman's Club on the occasion of the opening of its 1922 Follies at the Masonic Temple.

The President sent this message: "Greetings and good wishes to the Craftsmen's Club. Sincere congratulations on its progress toward full realization of the humanitarian ideals of a noble and inspiring order." The message was conveyed from the President's private telephone in the White House to the Anacostia Naval Wireless station five miles out of Washington, where a giant amplifier sent the words on their way north.

Immediately upon the receipt of the message the following reply was transmitted:

Hon. Warren G. Harding, President of the United States:

Your greetings and good wishes gratefully received.

Your message inspires our members to prayer that God may bless you and that our high ideals may be fully realized.

E. William Reusswig.

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Movies and Radiophones

IS the radiophone destined to become a feature of motion picture theatre entertainment?

This interesting question is well to the point in view of recent installations of wireless telephonic receiving apparatus in various playhouses throughout the country. While the matter cannot be said to be an entirely new innovation in the theatrical field, radiophones having been used in some of the larger theatres in connection with special events such as Presidential election returns and the like, indications at present point to a more widespread and actual interest in the subject.

The most recent radiophone receiving instruments to be installed in a motion picture theatre is the one at the Palace Theatre, Peoria, Illinois. Upon its success and the possibilities of entertainment which it affords, as well as the reception of the feature by the audience as a part of the Palace program, will depend the inauguration of similar arrangements in other houses.

Immediately following the installation of the instrument at the Palace Theatre two other Peoria playhouses announced plans for similar arrangements.

The first radio entertainment at

the Palace Theatre was given February 15 to 1,500 patrons at the regular show. When the curtain was raised at 9 o'clock the audience saw a radiophone on the stage and heard music from the transmitting station at Bradley institute. News bulletins received by a local paper were also transmitted to the audience. In the future patrons will hear radio matter transmitted from all parts of the country, including speeches, music, fight returns, baseball news and in fact anything else that may be picked up from the air and made audible to those in the theatre.

Further use of the radiophone will be made by the Palace Theatre by throwing the house open to the public on Sunday mornings to hear sermons and lectures broadcasted.

According to the Palace Theatre managers, the demonstration met with the hearty approval of the audience and furnished a new thrill.

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Tonsorial Parlor Installs Radio

THE radio family grows. Now it has a barber.

Patrons of E. E. Gist's barber shop at Detroit, Mich., hear above the singing of razor blades and the hum of vibrators, soothing music, striking speeches and interesting news bulletins coming into the shop by wireless.

"It's just an experiment," said Mr. Gist. "If it works out I plan eventually to put them in all my shops. There is no reason why a man should sit idly by while being shaved or having his hair cut, is there? With this wireless perfected he can sit back and listen to good music and speeches, get the news of the day and enjoy himself.

"You know the worst thing about a barber shop for the average man is the chatter he has to listen to from the barber who is working on him and who doesn't know that men don't like to be talked to while being shaved. Now with this wireless, men coming in here will enjoy a quiet and instructive entertainment."

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"Tuning In" on Congress

A DEBATE in Congress occurred recently concerning the installation of a radiophone broadcasting station in the Capitol. It was suggested that the people of this country might like to "listen in" on this august body. What would happen if our congressmen and representatives knew that the entire country was listening to their debates and speeches?

This is a question for politicians to answer.

Telephone Company's Accomplishments and Plans

WITH the opening on July 16, 1920, of the Avalon-Los Angeles Radio Toll Circuit, operated as a part of the telephone system by the Pacific Telephone and Telegraph Company, radio was introduced to regular telephone users. Connection to the wire circuits of the telephone system is provided on Santa Catalina Island and on the mainland at Long Beach, Cal. The circuit is equipped for through-line ringing, which is almost interference proof, and a system of simultaneous duplex telegraphy. The telegraph circuit, with terminals at Los Angeles and Avalon, replaced the Naval Telegraph Service when it was opened to commercial service on July 1, 1921.

On the Atlantic coast the problem of ship-to-shore communication has been studied in great detail and the experimental shore stations at Green Harbor, Mass., Cliffwood, N. J., and Deal Beach, N. J., together with the experimental ship stations installed on the SS. Gloucester and the SS. Ontario, were used in these extensive tests. The radio circuits on both the Atlantic and Pacific gave such satisfactory transmission as to permit their being connected to the longer telephone circuits of the Telephone system. This was dramatically demonstrated before the Communication Conference when the Gloucester, riding in the Atlantic, spoke with Avalon, Santa Catalina Island, in the Pacific.

More recently, however, broadcasting has come to be the vogue. With facilities for development increased, sending stations from which broadcasting was done were set up, and thousands of radio amateurs, whose receiving stations sprang up like mushrooms, were treated nightly to wireless concerts, market reports and the like.

A permit has ben granted for the erection of a radio telephone broadcasting station by the American Telephone and Telegraph Company on the roof of the twenty-four-story operating building between Walker and Lispenard streets, New York.

The new line of business to be handled by this radio telephone broadcasting station will be in charge of the Long Lines Department of the American Telephone and Telegraph Company.

For some time the radio section of the company's engineering department has been carrying on broadcasting experimentally. The record distance from which signals were heard was approximately 3,300 miles, when the station was heard by R. H. Horn of the Radio Corporation of America aboard the SS. Col. E. L. Drake, at sea 1,000 miles west of San Francisco. Other distant points heard from were Avalon, The Anaheim, Santa Maria, Oakland, Berkeley and San Anselmo, all of California; Pima and Clifton, Arizona; Silver City and Roswell, New Mexico; Vera Cruz, Mexico, and Halifax, Nova Scotia.

✦ ✦ ✦

1,000 Dance to Radio Music

MORE than 1,000 care-free lads and lassies wriggled their silken ankles to jazz melodies wafted on air waves over the Jersey meadows from Newark to Terrace Garden, New York, when the Empire State Novelty Six threw their saxophones into high and moaned ten miles away. The loud speakers and power amplifiers installed in the Garden and used for transmitting dance music batted 1.000. Scores of artists—vocal and instrumental—applauded the innovation. The overflow from the Radio Convention regarded the novelty as significant of what may be accomplished with music and waves. Hotels in Florida received the same music and undoubtedly many informal dances took place which have not been noted.

The melodies were perfectly timed, and the dance music continued from 10 to 11 o'clock.

✦ ✦ ✦

Radio Fans Mail Church Collection

WHEN the Rev. Edgar S. Wiers, pastor of Unity Church at Montclair, N. J., delivered a sermon recently which was broadcasted by radio telephone from the WJZ station in Newark, he did not expect that there would be any collection taken up as the result of his wireless services.

Such has been the case, however, for he has received several letters containing money contributions for his church from people who listened in at distant points in New York and New Jersey.

✦ ✦ ✦

Employees Band at WJZ

JUST to show the world that all the good talent hasn't left Newark, employees of the Westinghouse Electric and Manufacturing Company put on their own broadcasting feature recently.

The Westinghouse Employees' Association Band presented a programme of popular pieces in a manner that the workers at the big broadcasting station are confident will compare with the best outside talent. The band consists of twenty-eight pieces.

EXPERIMENTERS' WORLD

Views of readers on subjects and specific problems they would like to have discussed in this department will be appreciated by the Editor

Heating Vacuum Tube Filaments from 110 Volts D.C.

By H. P. Thomas

FIRST PRIZE $10.00

THERE is no question about the advantages of using the D.C. lighting circuit for lighting the filaments of vacuum tubes for receiving. The only question in the mind of an amateur who has a direct current lighting circuit is how to use it to the best advantage. I have used direct current with great success with very simple apparatus, and besides lighting the bulbs, I have added other desirable features.

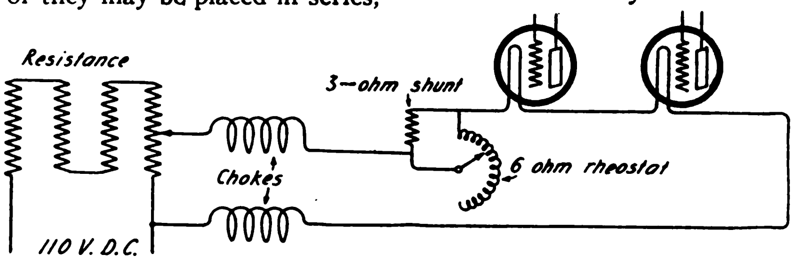
The resistance I use to cut down the voltage of the 110-volt line is a resistance similar to that used to run toy electric trains. It is composed of four porcelain tubes wound with German silver wire. On one coil is a slider to vary the current. Any amateur should be able to pick up such a piece of apparatus second hand easily, or he may build a similar one very easily. The resistance of the whole thing is about 45 ohms, and enough wire should be used to get this resistance. It should be noticed on the diagram, that the apparatus to be run is not merely placed in series with the resistance, but is shunted across a part of one coil.

Before using this apparatus, two small choke coils should be inserted in the leads from the resistance to the bulb. If this is not done, considerable inconvenience will be experienced from the hum from the generator, which becomes very annoying when listening for faint signals. I have successfully used the magnets from a four-ohm telegraph sounder for this purpose. Magnets for telegraph sounders can be obtained separately very cheaply, if the amateur has none on hand. By using these chokes, the hum is cut down so that it is practically impossible to hear it.

If more than one bulb is used, they may be connected either in parallel, as usual, or they may be placed in series, and one rheostat used to control the current through all the bulbs. Higher voltage is needed for this method. By merely pushing up the slider on the main resistance, voltages anywhere from about three or four up to twenty-four or five can be secured.

One advantage to be gained by using this resistance is close adjustment of the current supply, equal in fact, to that obtained by the use of a vernier rheostat. The slider on the main resistance can be varied so as to bring the current to about the desired amount, and then by using a low resistance rheostat instead of the usual form, very close adjustment of the current can be obtained. To avoid making a rheostat to get lower resistance, a very good way to do is to use an ordinary rheostat of about six ohms resistance shunted with a resistance of three ohms. The rheostat will then have a total resistance of two ohms. A resistance to be used as a shunt in this way can be made from about five feet of No. 30 iron wire. This can be wound into a coil of any convenient shape. I have used this method with very good results, and find it especially useful in tuning in C.W. stations, where a critical adjustment of the filament current is necessary.

If this entire apparatus is bought new, it should not cost more than a storage battery, and, unlike a storage battery, if obtained second hand, it is as good as when new.



Circuit diagram using D. C. house-lighting current for vacuum tube filaments

Alternating Current for Vacuum Tube Filament

By S. Weitzer

SECOND PRIZE $5.00

THE following experiments for replacing the storage battery for filament lighting were carried out by the writer, not as a means of temporary replacement, but for the permanent replacement of the expensive storage battery. For some time the writer was unable to obtain the use of a storage battery and later secured one of small capacity, which was not very satisfactory. Considerable time has been spent in attempting to devise a scheme whereby satisfactory results could be obtained from the 110 volts, 60 cycle lighting circuit. I shall state here frankly and accurately the results obtained.

The writer possessed two tubes: a Radiotron detecting (UV-200), and an amplifying tube. In the circuit of figure 1, the soft tube was first employed in an ordinary rectifying circuit. As the slider on the potentiometer was varied the A.C. hum was reduced considerably, but even at the best adjustment the induction was very uncomfortable and drowned out signals below a medium intensity.

The amplifying tube gave far better results in this circuit and the hum was practically inaudible — in fact, less than the induction often encountered in many stations. Obviously the hard tube gives more satisfactory results than the soft tube. Each tube was introduced into a regenerative-oscillating circuit. The hum of the soft tube was partly reduced upon maximum regeneration, but again became loud when the circuit was oscillating. The amplifying tube acted conversely. Slightly louder induction was obtained upon regeneration, but even then it was much weaker than that obtained with the detecting tube. When the tubes were brought into oscillation the amplifier was noiseless, and on long waves the action was the same as when the filament was lighted from a storage battery. The writer now uses regularly the amplifying tube in a regenerative circuit employing spider-webs or honeycomb coils, and enviable results are obtained.

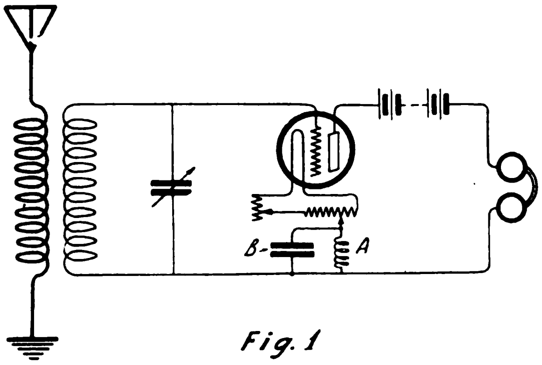


Fig. 1

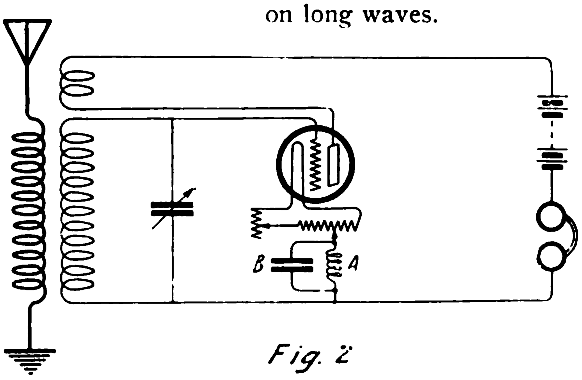


Fig. 2

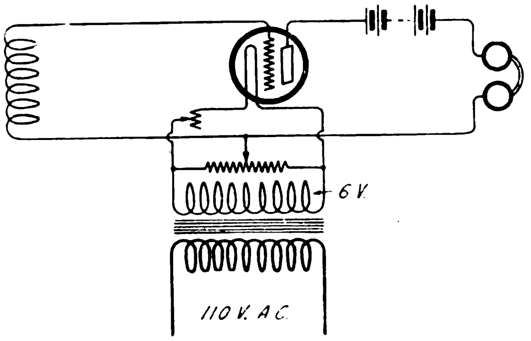


Fig. 3

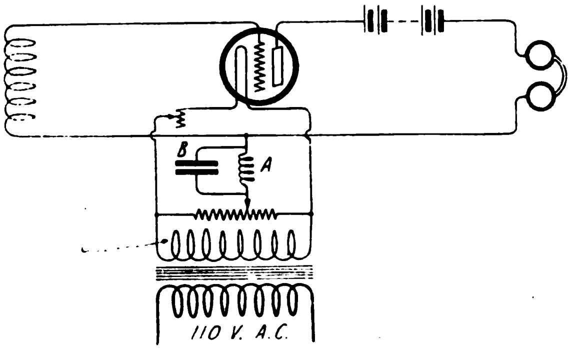


Fig. 4

Hook-ups using A. C. supply for vacuum tube filaments

It will be noted that essentially the usual method of balancing the voltage is employed. A potentiometer of 300 ohms resistance is shunted across the filament and transformer terminals. It is obvious from figure 3 that aside from induction from the filament to the other elements, the only means any A.C. has of getting into the circuit is from the common point on the potentiometer. Into this circuit is introduced a choke coil shunted by a large condenser (figure 4). The inductance used was a one pound spool of No. 36 D.C.C., and the condenser of about 4 mfds. A section of a spark coil — minus core — may be used as an inductance. Various values of inductance and capacity should be tried.

The circuit, AB (figure 2), has a frequency of approximately 60 cycles or a wavelength of 5,000,000 metres. This circuit which possesses the same frequency as the lighting circuit will most effectively prevent any current at that frequency to flow through it, but will easily allow current at any other frequency to pass. Such a circuit is known as a tuned impedance and reflects back any alternating current at the frequency to which it is tuned. The condenser B provides an easy pass for any high frequency current.

The transformer is a small toy transformer giving about six volts. The potentiometer may be of any resistance from 100 to 300 ohms. The rheostat should be adjusted before the potentiometer, as any change in the resistance of the rheostat will necessitate a readjustment of the potentiometer. The transformer and all A.C. wiring should be placed as far away from the receiving equipment as possible.

Most satisfactory results are obtained with the hard tubes. In the short-wave variometer type of receiver the circuit breaks into a hum at certain points, and is not as satisfactory as the three-coil receiver, the latter being ideal on long waves.

Prize Contest Announcement

The subject for the new prize contest of our year-round series is:

RADIO-DETECTOR - AUDIO CABINET

CLOSING DATE :: :: MAY 1, 1922

Contestants are requested to submit articles at the earliest practical date.

Prize winning articles will appear in the July, 1922, issue.

All manuscripts should be addressed to the CONTEST EDITOR OF THE WIRELESS AGE.

Considerable interest is being displayed just now in detector-amplifier cabinets employing one or more steps of radio frequency amplification, a vacuum tube detector and one or more steps of audio frequency amplification.

Prizes will be awarded to best articles on this combination cabinet and should contain constructional data wiring diagrams and wherever possible, photographs.

PRIZE CONTEST CONDITIONS—Manuscripts on the subject announced above are judged by the Editors of THE WIRELESS AGE from the viewpoint of the ingeniousness of the idea presented, its practicability and general utility, originality and clearness in description Literary ability is not needed, but neatness in manuscript and drawing is taken into account. Finished drawings are not required, sketches will do. Contest is open to everybody. The closing date is given in the above announcement. THE WIRELESS AGE will award the following prizes: First Prize, $10.00; Second Prize, $5.00; Third Prize, $3.00. *in addition to the regular space rate paid for technical articles.*

The Monthly Service Bulletin of the

NATIONAL AMATEUR WIRELESS ASSOCIATION

Guglielmo Marconi *President*
J. Andrew White *Acting President*
H. L. Welker *Secretary*

Founded to promote the best interest of radio communication among wireless amateurs in America

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HEADQUARTERS: 326 BROADWAY, NEW YORK

THE Central Illinois Radio Club, of Springfield, Ill., recently attempted a demonstration of radiophone reception from Pittsburgh and New York, but owing to disturbances from a leaky high-voltage power line nearby could not successfully carry out the program. Arrangements were made with a radio station at Taylorville, Ill., however, and the latter station received the Pittsburgh music and speech and retransmitted it by radiophone to Springfield, where it was clearly heard by means of loud speaking equipment.

Δ Δ

THE call of the amateur station of A. C. Mertz, Mt. Carroll, Ill., has been changed from 9AKR to 9ZG.

Δ Δ

A RADIO club has been organized at Bellaire, O., which is known as the Allied Radio Club, of Bellaire and Shadyside. W. J. Irvine is president. All amateurs interested are invited to join.

Δ Δ

IN response to an inquiry, the Postmaster General of Great Britain replied that the number of radio licenses issued to amateur experimenters for reception only was 6,986, and for transmission 286.

Δ Δ

THE equipment used by G. J. Eschauzier, 19 Parkweg, The Hague, Holland, at the time signals from Station 1BCG, Greenwich, Conn., were heard during the Trans-Atlantic tests, consisted of the following:

Aerial: Three wires 60 feet long, 35 feet above house which is 45 feet high.

Apparatus: A four-electrode Schottky tube, as a detector, with two steps of audio-frequency amplification.

Receiver: Two-circuit, with variometer coupling.

Δ Δ

RADIO students at St. Xavier college Cincinnati, O., enjoyed the concert given by the Detroit Symphony Orchestra at Detriot, Mich, on February 10, when they listened to the wireless at that institution.

Δ Δ

THE Radio Club of Long Island has elected P. B. Ferguson honorary president; J. D. Fowler, acting president; Samuel M. Christie, vice-president; William Eckert, secretary, and Edward Fenn, treasurer.

A board of directors has also been elected with Ed. Fuerhusen, operator of a radio station in Richmond Hill, as chairman; other members of the board are: L. S. Browne, F. W. Miller, William Reuman.

Δ Δ

AGAIN the radio department of the University of Vermont has come into the limelight as one of the leading amateur radio stations in the United States. According to information recently received by G. H. Brodie, U. V. M., '21, in charge of the radio station at the University, the calls of this station have been heard by the station at Avalon, Catalina Island, 30 miles off the coast of California, also by the station at Tucson, Arizona, and by a ship in port at Chorrera, Mexico. This means that the station at the University of Vermont, with the low power and low wave length which amateurs are obliged to use in operation, has been able to bridge the continent, a feat accomplished by only one other station using a single 50-watt Radiotron.

In connection with this accomplishment, and the record which the University of Vermont made during the recent trans-Atlantic tests of the American Radio Relay League, Mr. Brodie says:

"We believe that these transmissions, in connection with our transmission to Scotland, during the trans-Atlantics, constitutes a new record for total miles covered by a fifty-watt CW set.

"The wave length on which these transmissions were made was approximately 225 meters."

Official recognition of the receipt of calls from the U. V. M. station by the station at Avalon, Catalina Island, California, was received by Mr. Brodie from Lawrence Mott, associate editor and president of The CW Association of America, who wrote Mr. Brodie under date of January 26:

"Just a few lines to apprise you of the fact that last night, at 1.52 a. m., Pacific Coast Time, I got your calls and the reception of your signals was very good."

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FROM every corner of the city and neighboring counties radio men attended a regular monthly meeting of the Tri-County Radio Club on February 5 in the John Marshall High School. The program for the evening consisted of talks and practical demonstrations in radio work.

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HAROLD M. LEFFINGWELL, 23 years old, 1010 North Pine street, Lansing, Mich., is said to be the only blind person in the United States who has successfully passed the Federal "first grade amateur" radio examinations. In tests held here in Lansing recently by A. F. Parkhurst, Federal examiner this youth, who has never seen the light of day, passed the highest examination in the class, with a grade of 93 per cent.

Harold studied at home, first learning the mysterious touch system of reading by the Braille method from books with pages of raised letters.

"It was just a step, you see," he explained, "from the dots of the Braille books to the dots and dashes of the telegraphic code. And then I became interested in wireless about two years ago."

In addition to reaching a high stage of proficiency in wireless telegraphy, that permits him to send 25 to 30 words a minute, and to receive 20 or more, to adjust, install and care for his own instruments, Harold is an efficient stenographer and piano tuner.

Though his sending apparatus is limited to sending but a few miles, Harold and his friends, many of them blind and students at the Lansing School, have listened in on radiophone messages and concerts broadcasted from far and near. The Government radio station at Arlington, ships in mid-Atlantic, and The Detroit News carry on by day and night with countless others in penetrating space, and each is at the finger tips of the blind youth.

His equipment for sending and receiving is simple, but practical and effective. The antenna strung between the house and barn at an average height of 30 feet, is 80 feet long and consists of two strands of No. 14 copper wire. He uses an old-form tuner, and simple audion detector. He has no amplifier, but uses double phones. The addition of a "squeek-box" or spark coil, gives his equipment a sending radius of a few miles, sufficient to converse with other amateurs about Lansing and East Lansing.

Δ Δ

THE first successful wireless track and field meet in the history of radio telegraphy was held between the Universities of Iowa and Wisconsin recently. Through the co-operation of the Electrical Engineering and Athletic departments of the two universities this novel scheme worked perfectly in every detail. The events of the meet were staged with the Iowa team running against time at Iowa and the Wisconsin team running against time at Wisconsin. Immediately after each event the time and score were exchanged by radio between the Wisconsin station and the Iowa station, and in this manner the meet progressed exactly as if the two teams were at one place and not several hundreds of miles away as was the actual case. Experienced operators handled the wireless instruments at both stations and the exchange of scores took place without a break in the entire program.

Δ Δ

PROF. F. F. HOUSEHOLDER is now installing a complete radiophone equipment in the physics laboratory of Municipal University, Akron, O. When finished, students will be able to hear concerts and addresses from New York, Pittsburgh, Chicago and other large cities.

Δ Δ

THE Monthly meeting of the Gargoyle club of St. Paul, Minn., was held at the St. Paul Athletic club on February 13. The program was in keeping with the St. Valentine day spirit and the commemoration of Lincoln's birthday.

Dinner was followed by entertainment, after which the members joined the Engineers' Society in another room to hear an address on "Modern Radio Communication," by Prof. C. M. Jansky, Jr., of the University of Minnesota.

WITH the adoption of a constitution and by-laws, election of officers and the completion of other details, formal organization of the Milford, Conn., Radio Club took place recently at an interesting meeting held at the radio station of W. H. Gilbert at the rear of 14 Center street. Plans were also discussed for the future of the organization, and judging from present indications, it will not be long before Milford will be a center of radio activities.

△ △

THE Harvard Wireless Club is working on plans for an intercollegiate wireless news service, it was announced recently. The club has arranged to have men on duty at certain hours each day and will try to draw up schedules with other colleges. The club is equipped with a transmitting set which will send 500 miles and a receiving set which will pick up messages from any point in the United States east of Mississippi.

Arrangements are to be made with Dartmouth, Princeton, Yale, Brown and Tufts for the proposed news service.

Teacher at Lane Technical High School, Chicago, explaining the operation of a radiophone to a class of students

A RADIO club has been organized at the Havana, Ill., high school under the supervision of L. L. Scranton. The club is attracting much interest in Havana. On February 21, at the organization's second meeting, officers were elected, and further plans of organization were discussed. Officials to head the organization for the year are John Brunning, president; Eugene Wilson, vice-president; Gilbert Rengstorff, secretary, and Oren List, treasurer.

△ △

MARK CLEMENT, 14-year-old Pittsburgh boy who left his home on October 15 in company with David Poole, English sailor, and who was seen here about two weeks ago in company with the man, is being hunted all over the south by his father, George F. Clement, 7301 Pennsylvania avenue, Pittsburgh, Pa., a wealthy manufacturer. The father has offered a reward for information regarding the boy and has sent broadcast over the country messages by amateur radio stations, giving an accurate description of each.

Last week G. L. Hight, local wireless operator of Rome, Ga., received a message from the boy's father to be sent over the country, with the hope that it would be picked up by someone recognizing the boy.

△ △

BELIEF on the part of users of amateur radio telephone apparatus that the radio conference recently in session at Washington was directed toward restricting amateurs in their development of wireless telephony, as expressed by Paul F. Godley, of Cedar Grove, N. J., brought from Secretary Hoover vehement denial that the conference had such a purpose.

Mr. Hoover declared whoever started such a report was "maliciously fabricating." The Secretary asserted that the primary purpose of the conference was for the protection and encouragement of amateurs in the use of the new means of communication.

△ △

THE Hudson County Radio Club, with which many amateurs are affiliated, held its regular semi-monthly meeting on February 13 at the Standfast Club, Bacot Place, Jersey City, and the affair was well attended. The regular routine business was transacted.

Gaylord Smith of Jersey City, the president of the club, who had charge of 2AWE station, spoke on the development of radiophones. He spoke at length on the subject and described the various pieces of apparatus composing the instrument.

△ △

BOYS and girls of the John Ericson Junior High School, at Guernsey street and Meserole avenue, Brooklyn, have become radio enthusiasts. A complete wireless outfit has been placed in the workshop of the school. Daily, when the programs of songs, speeches and news reports are sent out from the various broadcasting stations, pupils are permitted to listen in. The outfit is the property of William A. Walsh, instructor in shop work. It was set up as a result of a suggestion by Principal Joseph A. Haniphy. A radio club is to be formed shortly.

△ △

THE speaker for the monthly meeting of the Mohawk Valley Engineers' Club, Utica, N. Y., which was held at Hotel Martin on February 21, was Calvin B. Rice, secretary of the American Society of Mechanical Engineers, and B. R. Cummings, engineer of the radio department of the General Electric Company. The latter demonstrated and explained, with the aid of apparatus, the sending and receiving of long distance messages.

This was followed by an address by Mr. O'Connor of the J. & M. Electric Co., terminating at 10 o'clock, immediately following which there was dancing until midnight.

△ △

THE Masonic club of Warsaw, N. Y., has installed a wireless receiving set in its club rooms in the temple. Amplifiers of large size have been attached, making it possible to hear lectures, instrumental and vocal music anywhere in the room.

△ △

AMATEURS interested in radio telegraphy and telephony are soon to be eligible for membership in the Radio Club which has been formed at Stevens Institute of Technology, Hoboken. Men interested in the valuable help and advice given by the "Tech" radio operators should attend the next meeting of the club and arrange to join it. The club plans to hold a number of sessions during the spring term and talks on subjects of a popular and practical nature are being scheduled.

Recent developments in the radio world, the broadcasting of music and news, and the unprecedented interest aroused everywhere by the practical use of wireless are the factors behind the statement issued by the Radio Club, offering its co-operation.

At a recent meeting of the organization, B. Guild, '23, was elected president for the remainder of the term and H. Schlecta, '23, was chosen secretary-treasurer.

△ △

WIRELESS was seen, heard and almost eaten on February 8 at a banquet given by the Houston, Tex., Radio Club at the Young Men's Christian Association.

Talks were delivered by F. M. Corlett of Dallas, division manager of the American Radio Relay League, and L. B. Henderson, also of Dallas, assistant in charge of police broadcasting in Texas.

On the program also was H. E. Worthington, district superintendent, Houston; W. A. Tolson of A. and M. College, assistant district superintendent, and A. P. Daniel, assistant divisional manager for the national body and president of the local club.

△ △

THE newly organized Radio club of Quincy, Ill., met for the first time, in the lobby of the Y. M. C. A., January 31. E. C. Hurdle, of the Gem City Electric Company, recently elected leader of the club, instructed the boys in the wireless code.

Plans for a city-wide employed boys' conference, to be held at the Y. M. C. A., March 16, were discussed at a meeting of the boys' work committee, February 1, at which time Mr. Hurdle was appointed leader of the radio club. W. Gerdes was appointed chairman of a committee to make arrangements.

△ △

PLANS have been completed for the installation of a radio outfit at the new headquarters of the Bronx Division, U. S. Junior Naval Reserve, at 283 E. Kingsbridge Road, N. Y. City. The Reserve is occupying the headquarters in conjunction with the William A. Brady Post, veterans of Foreign Wars.

The new home consists of a three story, brown shingled building which has been entirely renovated to suit the needs of the Reserve. On the lower floor is the commandant's office, regimental headquarters and a meeting room. The upper floor will be used for the instruction of cadets in seamanship, engineering and radio.

The radio equipment is expected to equal any in the Bronx. It will afford cadets practical experience in this popular and fast growing science and bring to headquarters concerts and other events which are broadcasted.

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AT a special meeting of the Poughkeepsie, N. Y. Radio Ass'n, held in Columbus Institute the following officers were elected to serve until next October at which time the regular terms of office begins: President, Frank N. Mylod; Vice-President, George H. Underhill; Secretary, Robert Hawkey; Treasurer, Harold A. Decker. Directors were also elected at this meeting as follows; For one year, George H. Underhill, Harold S. Brower, William S. Merritt; for six months, Bernard A. Cruger, William H. Converse, Jr., and Robert Hawkey.

Several changes were made in the tentative constitution which is to govern the association for two months after which period it will be formally adopted if found satisfactory.

Chairmen will be appointed to head committees on membership, radio traffic problems, education, entertainment and publicity. These chairmen will be selected immediately in order to start the club's activities. All amateurs are invited to join this live organization.

Δ Δ

NEWTON O. BURNETT of Cornell University, Ithaca, N. Y., station call 8XU, reports that excellent results were obtained using a fire escape on the south side of the building as an aerial and the following receiving equipment: Paragon RA-10 Regenerative Receiver, Radiotron detector tube, Baldwin and Brown phones. M. G. Pawley of 8BQV was operating the set on the morning of February 21 when the following stations were logged: 5ZA, 5XB, 5ZU, 5ZAP, 6ZZ working 6ZF at 1.35 A. M., and 6ZF working 6ZZ at the same time. We entirely disconnected the fire escape from the set and were still able to read both of these stations using only the ground for receiving. On the morning of February 27 stations in every district were logged including the following: 5ZA, 6ZF, 6ZZ, 6XAD, 7ZM. All of the 6th district stations were using CW transmission and the 7th was using spark.

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HENRY B. JOY of Grosse Pointe Farms, Mich., reports that on Saturday, February 25, 1922, Clyde E. Darr, while working Mr. Joy's station, 8XAE, communicated by CW shortly after 11 p. m., with 3ZP, the station of Horace A. Beale, Jr., at Parkesburg, Pa., after which a shift was made to voice. The communication was very satisfactory (barring QRM) for the period of the talk, about 15 minutes. At times when QRM let up the strength and clearness of 3ZO was marked.

This test resulted in unsolicited reports from various localities, as follows:

L. B. Buchanan, Boston, Mass.; Walter Knight, Hudson, Mass.; Frank J. McKay, Holyoke, Mass.; John R. Mansfield, Bondsville, Mass.; Bernard Y. Susman, Bridgeport, Conn.; Henry Opperman 3d, New York City; Burton C. Belden, Fredonia, N. Y.; E. A. Donahue, Raleigh, N. C.; R. L. Bowman, Wadesboro, N. C.,(10 miles from S. C.); Minnich Radio Experiment Station, Weston W. Va.; Harry G. Miller, York, Pa., Hugh T. Smith, Wyoming, O.; D. H. Stover, Freeport, Ill.; Lothrop Smith, Winterset, Ia.

Δ Δ

ON Saturday evening, February 4, there was organized at New Brunswick, N. J., a club to be known as the New Brunswick Radio Club, with a charter membership of thirty-five. Officers elected were: President, Norman Van Hoeval, 2AYV; vice-president, John Cost; recording secretary, Clifford Holman, 2AZY; treasurer, Walter Shepherd, 2BME; corresponding secretary, W. H. Everson, 2BMC. The club meetings are to be held at 8 o'clock on the first and third Saturdays of each month.

Alternating Current for Filament and Plate

(Continued from page 46)

of the rudiments of electricity, it would probably be advisable to try the circuit. By experiment the amateur will grasp the idea as to the correct adjustments and will be surprised with the fine results obtained.

A careful study of figure 1 in connection with the key to the diagram which follows, together with another perusal of the original article, will be found to give you sufficient details to construct and operate this circuit.

Key to Diagram

R^1—Filament lighting resistance 4 to 6 ohms, 1½ amperes carrying capacity.

R^2—Potentiometer 200 to 400 ohms. The adjustment of this center contact will eliminate the line hum from the 60-cycle current.

R^3—Potentiometer of 4,000 ohms. The correct adjustment of this potentiometer will supply the detector tube with the proper plate potential. This adjustment is quite critical, but once the proper setting has been found, the results obtained will be found to warrant the time necessary to make the adjustment.

P^1—One-half of the primary winding, 220 turns, No. 22 D.C.C., wound upon the long leg of the core. There is a layer of shellacked paper between this winding and the core and also on the outside of this winding, to come between the primary and the secondary winding when the latter is wound on top of the primary.

P^2—Second half of the primary winding, also 220 turns, wound upon the core and insulated from it in the same manner as the first half of the winding.

S^1—One-half of the plate potential winding, wound upon the insulation which is on top of the primary winding. This secondary coil consists of 160 turns of No. 32 D.C.C. wire as specified in the original article.

S^2—Second half of the plate secondary, also 160 turns, wound upon the second half of the primary and insulated from it.

S^3—One-half of the filament lighting secondary, consisting of 12 turns of No. 18 double cotton covered wire wound upon the core, with two or three layers of shellacked paper between the core and this winding.

S^4—The second half of the filament lighting secondary wound upon the core and insulated from it in the same manner as the first half.

Great care must be observed in winding the coils of the transformer in the same direction, so that if any two halves of one winding were removed from the core and placed end to end the winding would be continuous and not double back upon itself. If it appears to reverse its direction of winding, the two coils will "buck each other," and no voltage will be obtained from that particular winding.

It might be advisable, in order to construct a transformer which will have especially long life, to insulate the windings one from the other and from the core by means of Empire cloth, which is a special type of insulation employed in power transformers. This may be obtained from any of several electrical supply houses, whose advertisements may be found in this magazine.

Strips of lead and aluminum will probably be found to give better results in the rectifier than the two metals, tin and aluminum, mentioned in the original article.

To obtain the best results in the construction of the core, after each lamination has been cut out and given one coat of shellac it should be allowed to dry and then be given a second coat. In constructing the transformer it will be found that the simplest method is to wind the coils upon a cardboard tube having the same shape as the core and then slip the coil on the core after it has been wound and bound to prevent it from coming apart. Before starting the winding of the coil lay several threads along the winding form parallel to its axis and spaced equally, four threads will be sufficient. Have each thread about four times as long as the coil is to be. Shellac each thread to the coil form at the ends in order to keep them out of the way while the winding is in progress. Now wind the coil on the form and after it is completed the ends of the threads can be unfastened from the form and tied around the coil before it is slid on to the core thus preventing it from coming apart.

It is to be expected that a great many different results will be obtained by various experimenters from the use of this device as there are a variety of considerations that enter into its use which cannot be changed by the constructor. One of these factors is the exact condition of the A. C. line upon which it is used, that is, the power factor of the line. The experimenter will have no means of knowing what the latter is, and even if he did, there would be no means of varying it, so the circuit must need a small amount of experimentation to obtain the best results.

The editors of this magazine would be very glad to hear just what results are obtained from this circuit by different experimenters so that any desirable matter can be passed through the pages of this magazine to others who are interested.

STATIONS WORKED AND HEARD

Stations worked should be enclosed in brackets. All monthly lists of distant stations worked and heard which are received by the 10th of each month will be published in the next month's issue. For example, lists received by November 10th will be published in the December issue. Spark and C. W. stations should be arranged in separate groups.

1BDI, 412 H. H. HALL, University of Maine, Orono, Maine. (February)

CW--1AIP,1AKB,1AOK,(1AR),(1ARY), 1AVR, (1AWB), 1AXI, 1AZW,(1BAS), 1BCF, 1BDC, 1BDT fone, 1BEA, 1BEC, (1BES), (1BFU), 1BH,1BJH, 1BKQ,1BKR 1BLA, (1BLE), 1BLN, 1BLT, 1BOQ, (1BQE), 1BTI, (1BTU), 1BUA, (1BWJ), 1BYG,1CAC, 1CAK,1CGG, 1CGO,(1CGS), 1CIK,1CIT,1CIV fone,(1CLI),1CLN,1CLZ, 1CMK, 1CNF,1COD, 1CQG,(1CRA),1CRT, 1CTZ, 1CW, 1CY, 1IV, (1OT) Fone, 1PT, 1QN, (1QP), (1RD), 1RZ, (1TS), 1UN, (1XM), 1XX, 1XAD fone, 1YK, 1ZE, (2AAB), 2ABQ, 2AER, 2AFP, 2AFV, 2AJA, 2AJF, 2ALR, 2AOS, 2AQU, 2AWL, 2AWS, 2AXK, 2AYV, 2AZO, 2BAK, 2BAY, 2BB fone, 2BBB, (2BCF), 2BDM, 2BEA, 2BEB, 2BEH, 2BGI,(2BIG), 2BML, 2BNC, 2BNZ, 2BRC, 2BTW, (2BTZ), 2BUM, (2BXP), 2BYS, 2BZV, 2CAT, 2CAU, 2CBG, 2CCU, 2CCY, 2DK, 2DR, 2EH, 2FP, 2FG, 2JJ, 2KP, 2KV, 2LO, 2NZ, 2OF, 2OM, 2OU, 2PZ, 2SG, 2TP, 2UJ, 2VA. 2VD, (2WI), 2YE, 2ZY, 3AAY, 3ADT, (3AFB), 3ALN, 3ALU, 3AMH, 3AMP, 3ANO, (3ANJ), 3AOD, 3AOL, 3AQH, 3AQR, (3ASO), (3BA), (3BAG), 3BEC, 3BFW, 3BG, 3BHL, 3BIJ, 3BL, (3BLF), 3BNU, 3CA, 3CC, 3CG, 3CM, 3EM, 3FM, 3FS, 3IZ, 3KM, 3LC, 3LR, 3NH, 3NO fone, 3RF, (3SQ), 3VW, 3WF, 3ZAB, (3ZO), (3ZY), NZO, (NMW), 4BQ, (4BY), 4GL, 4FT, 4II, 5FV, 5UU, (8ADG), 8AGZ, 8AHR, 8AIM, 8AIO, 8AIZ, 8AMM, 8AMQ, 8AND, 8ANJ, 8ANR, 8AOA, (8AOB), 8AOO, 8AQF, (8AQV), 8ARK, 8ASG, 8ASV, 8AVH, 8AWM, 8AWP, 8AWY, 8AXK, 8AYZ, 8BAE, 8BBD, 8BBK, 8BDO, 8BDU, (8BEF), 8BEI, 8BFU, 8BFX, 8BIL, 8BIZ, (8BK), 8BLT, 8BNJ, 8BOX, 8BRL, 8BUM, 8BUQ, 8BVR, 8BXH, 8BZY, (8CAZ), 8CFP, 8HMA, 8HT,(8JL), 8KS, 8LF, 8NB, 8NH, 8NI, (8LX), 8OS, 8QB, 8QM, 8SP, (8TB), 8UJ, 8UK, (8VJ), 8VY, 8XV, 8YAA, (9AAV), 9AG, 9AJH, 9AKR, 9ALS, (9AJA), (9AYH), 9BRL, 9DAM, 9DKH, 9DYN, 9DV, 9HW, (9IO), 9KP, 9NX, 9XAQ, 9XI, 9YAM, 9ZAF, 9ZJ.

Spark—1AA, 1ACO, 1ADL, 1ADP, 1AHD, 1AIT, 1AKC, 1AKG, 1AKY, 1AMD, (1APO), 1APT, 1ARY, 1ASF, 1AW, 1BCF, 1BDL, 1BDT, 1BFE, 1BGF, 1BGI, 1BHJ,, 1BHO, 1BHR, 1BIR, 1BJE, 1BJS, (BJZ), 1BOQ, 1BRQ, 1BQA, 1BSD, 1BVB, 1CHJ, 1CM, 1CNI, (1CNP), 1CZ, 1DL, 1FU,1GM,(1GQ),1HO,1LZ,1OJ,1RV, 1SD, 1SN, 1UL, 1WQ, 1YB, 1ZE, 2AAC, 2AAF, 2AC, 2AHU, 2AJE, 2ASL, 2AWF, 2AXK, 2BJO, 2BK, 2BM, 2BSC, 2DA, 2EL, 2FP, 2JZ, 2OM, 2PB, 2PZ, 2TS, 2WB, 2WM, 3ARM, 3BP, 3FB, 3FP, 3HJ, 3OW, 3PB, 3RW, 3UC, 3UD, 3UQ, 3XM, 8AHH, 8AKQ, 8AMZ, 8AOA, 8ASO, 8AXY, 8AYN, 8BVS, 8TB, 8WH, 8WO, 9BP, 9DLX.

2OM—F. B. OSTMAN, Ridgewood, N. J.

Spark.—1ACK, 1ADC, (1ADL),(1AKC), 1AKG,(1AMD),(IAPO),(1ARY),(1AW), (1AZK),1BCF,(1BDT),(1BHR), (1BJE), 1BOQ, 1BQA, 1BQL, (1BRQ), (1BVB), 1BWY, 1BYG, 1CC, 1CDJ, 1CHJ, 1CK, 1CM, (1CNI), (1CP), (1CZ), (1DY), (1FM), (1GM), 1HO, 1IN,(1LZ),(1MA), (1OJ), (1RV), 1SD, (1SN), (1WQ), 1YB, 1YD, (2AWF), (2GK), 2PV, 2SZ, 2XQ, 3AAL, 3AAM, (3AC), 3ACK, 3AGT, (3AHK), 3AIC, 3AJD, 3ALN, 3AOR, 3ARM, (3ARN), 3ATZ, (3AUW), 3BFU, 3BGT, 3BG, (3DM), 3FB, 3FP, (3GM), 3GX, 3HG, 3HJ, 3JL, 3NB, 3OO, 3OU, 3RW, (3TA), 3TH, 3TJ, (3UC), 3UD, (3US), (3XM), 3YV, (3ZZ) Canadians, (3BP), (3EI), (3GE), (3GN), (3KG), (4AG), 4AS, 4AU, 4BI, 4BQ, 4BX, (4CG), 4CP, 4CX, 4DH,(4DZ),(4EA), 4FD, 4GN, 4HS, 4XC, 4YA, 5AA, 5DA, 5EA, 5ER, 5FJ, 5HK, 5JD, (5PY), 5QS, (5XA), 5XU, 5ZL, 8AAV, 8ABG, 8ABO, 8ACF, 8AEC, (8AFA), 8AFD, 8AFG, (8AGK), 8AH, 8AHF, 8AHH, (8AHQ), 8AHS, (8AIT), 8AJT, (8AJW), (8ALO), 8AMB, 8AMK, (8AMZ), 8ANO, 8ANU, 8ANW, 8AOH, 8AOW, 8APB, (8ARD), 8ASL, 8AUV, 8AUX, 8AVD, 8AVO, 8AVT, 8AW, 8AWU, (8AXC), 8AXO, 8AXQ, (8AXY), (8AY), 8AYC, (8AYN), (8AYX), (8BA), (8BAZ), (8BBO), (8BBU), (8BCK), (8BDY), 8BEP, 8BFM, 8BFY, 8BHV, 8BK, (8BM), (8BN), 8BO, (8BRL), 8BTG, 8BU, 8BUN, 8BVS, 8BXA, 8BXX, (8BYP), (8CAY), 8CG, 8CP, (8EA), (8EB), 8EO, (8EW), 8FA, (8FI), 8FZ, 8HD, 8HG, 8IH, 8IN, (8JJ), 8JL, (8KK), 8KU, (8KY), 8LB, (8LH), 8MR, 8MZ, 8NO, 8NZ, 8PL, (8QQ), 8RQ, (8RZ), (8SP), 8TK, 8TT, (8UC), 8VH, 8VQ, 8VR, 8VW, (8WD), (8WE), (8WO), 8XE, 8YB, 8YV, 9AAW, 9ACB, 9ACN, 9AEK, (9AGR), 9AIG, 9AIP, (9AIU), 9AOE, 9APS, 9ASJ, 9ASN, (9AVP), 9AWZ, 9AZA, 9AZE, (9BP), (9CP), 9DCV, 9DCX, 9DFX, (9DGX), 9DHG, (9DKV), 9DLX 9DRK, 9DSO, 9DUG, (9DWP), 9DYU, (9FK), 9GO, 9GX, 9JN, 9JQ, 9LF, 9MH, 9NQ, 9OA, (9OX), 9PO, 9PS, 9TL, (9UH), 9UU, 9VL, 9VV, (9WK), 9WT, 9WW, 9YC, 9ZJ, 9ZN.

Distance Records

WHEN signals from a radio station are heard at unusual distances it is proof that the station is an efficient radiator of energy. The location, apparatus, construction and operation of an efficient station is therefore, of great interest to all amateurs, and The Wireless Age wants this information.

You are therefore requested to send us a monthly list of distant amateur stations heard, which will be published regularly. Report only stations located 200 miles or more distant from your station. Arrange the calls by districts in numerical order.

State whether the stations heard use a spark or C. W. transmitter. The Wireless Age will follow the records closely and whenever possible will secure and print illustrated articles on the stations consistently heard over long distances, for your benefit and the benefit of amateurs.

If a station is an efficient radiator of energy, it should be given proper credit in the history of amateur progress, and at the same time you will be given credit for efficiency in receiving in having heard it, as your name, address and call letters will be published with all lists submitted by you.—The Editor.

C. W.—1AVR, (1AZW), 1BDI, 1BES, 1BQE, 1BUA, (1CAK), 1ES, 1PT, (1UT), 1ZE, 3AP, 3APA, 3AQR, 3ARW, 3BG, 3BIJ, 3BLF, 3BMJ, (3CG), 3SM, 3UB, 3ZY, 4BY, 4EW, 4FT, 4GL, 4ID, 4II, 4ZE, 5BB, 5DA, 5EK, 5FV, 5KK, (5UU), 8ABB, 8ABV, 8ACB, 8AGZ, 8AIG, 8AKJ, 8ANJ, 8AQV, (8AWP), 8AXK, 8BDO, 8BNY, (8BUM), 8BVR, 8CAZ, 8NB, 8OS, 8UK, 8VL, 8ZV, 9BED, 9BM, 9DAX, 9IO, 9JL, 9KP, 9NX, (NOF), NZO.

2CIZ, PRESTON D. BALDWIN, Staten Island, N. Y. (February)

CW—1AFU, 1AMZ, 1ARY, 1AUR, 1BKQ, 1QW, 1ZE, 3NH, 3ZL, 8AZD. 8BKQ, 8BUQ, 8GW, 8LT, 8OS.

Spark—1APO, 1ARY, 1BQL, 1CHG, 1CK, 1HO, 1LZ, 1ON, 1RV, 3AIC, 3AJO, 3AUW, 3AXK, 3DM, 3XM, 4EA, 8AFA, 8AFG, 8APB, 8ARD, 8AUX, 8AWN, 8AXY, 8AYN, 8AZD, 8BCK, 8BDY, 8BO, 8BOK, 8BRL, 8OD, 8UC, 8VW, 8WD, 8WO, 8YO, 9AGR, 9AWH, 9AZE, 9TL, NOF, Canadian 3GE.

8AXC, 8YAA, EDWARD MANLEY, 328 Fourth Street, Marietta, Ohio. (February)

Spark—1AW, 1QP, (2BK),2EL, (2OM), 2XI, 2AJE, 2BJQ, (2BSC), 3CG, 3DM, 3GM, 3GZ, 3HJ, 3PU, 3QW, 3TJ, 3XM, 3YP, 3ZO, 3ZS, 3ZZ, 3AHK, 3AIA, 3ALN, 3AOV, 3AUW, 3BFU, 4AG, 4AU, 4BI, 4CG, 4CH, 4CP, 4DH, 4GN, 4GU, 5DA, 5NS, 5PY, 5UC, 5WE, 5XB often, 5XI, 5XU often, 5YE, 5ZL, (5ZAB),5ANY, 8BO, 8CH, 8EB, 8FT, 8HG, (8IN), 8OI, 8PT,8SP,(8UC),(8UK),8WE,8WO,(8XE), 8YU, 8ZA, 8ZAA, (8ZAC), 8ZP, 8AAV, 8AFG, 8AHS, (8AJT), 8AJX, 8AKW, 8AMZ, (8ANO), 8ARD, 8AUE, 8AUY, 8AVO, 8AYN, 8BBU, 8BDO, 8BFH, 8BHV, 8BUN, (8BXC), 8CAY, 8CHO, 9AR, 9AU, 9BP, (9CP),9FX, 9HR,(9OX), 9RY 9UH, 9UU, 9WT, 9XM, 9YB, 9YC, 9YQ, 9YAE, (9ZJ), 9AAJ, 9ACH, 9ACY, 9AEY, 9AGR, 9AIG, 9AIR, 9AIU, 9ASJ, 9ASU, 9AVP, 9AXU, (9AZA), 9AZE, 9BKH, 9DCX,9DDV,9DFX, 9DHZ,9DMJ, 9DMM, 9DQQ, 9DSO, 9DZY, Canadians 3BP, (3GN), 3JO, 3KG, 3SL.

C. W.—1QN, 1TS, (1XM), 1YI, 1ZE, 1XAD fone, 1AGI, 1AQW, 1AVI, 1AVR, 1AWB, 1AYL, 1AZW, 1BDI, 1BEA, 1BGF, (1BKQ fone), 1BNI, 1BZE, 1CGS, 1COD, 2FP, 2KY, 2LO, 2NZ, (2WI), 2XQ, 2ZK, 2AAB, 2AFP, 2AGB icw, 2AJF, 2ARY icw, 2AWF, 2AYV, 2BEB, 2BFX, 2BFZ, 2BNC, (2BTJ), 2BUM, 2CBG, 2CBR, 2CCD, 3BA, 3BG, 3CA, 3CG, 3CM, 3FM, 3FS, 3HG, 3IZ, 3JJ, 3KM, 3OB, 3QV, 3RF, 3SQ, 3WF, 3XL, 3XW, 3ZO, cw icw fone, 3ZY, 3AAD, (3AAE), 3AAG, 3AAH, 3AAY, 3ADT, 3AFB, (3AHK fone), 3AJD, 3AEN, 3ALN, 3AMJ, 3AQR, 3BEC, 3BER, (3BHL), 3BIJ, 3BIY, 3BLF, 4AZ, (4BK), 4BQ, 4BY, 4CL, 4CO, 4CY, 4DC, 4EN, 4EU, 4FT, 4GL, 4GU, 4HW, 4ID, 4JH, 4YA, 4ZE, 5EK, 5FV,, (5JB), 5JD, 5KP, 5KU, 5NZ, 5TG, 5UU, 5XA, 5XU, 5ZA, 5ZL, (5ZU), 5ZAP, (5AAM), 5ALE, 6ZF ten watts, 6ZZ, (8AK), 8BK, 8BO, 8BU, 8CG, 8DR, 8HJ, 8JL, 8JW, 8JZ, 8NI, (8OC), 8OW, 8QB, 8SP, 8UJ, 8UK, 8VJ, 8VQ, 8VY, 8WR, 8XAE cw fone, 8ZG, 8ZP, 8ZV, 8ZZ, 8ZAE, 8AAO, 8ADG, 8AGO, 8AGZ, 8AIG, 8AIM, 8AIO, (8AJV), 8AMF, 8AMM, 8AND, 8ANT, 8ARD, 8ARI, 8ARU, 8ASB, 8AVD, 8AWP, 8AWY, (8AWZ), 8AXK, 8AYZ, 8BAE, 8BBD, 8BBK, 8BBU, 8BDU, 8BEX, 8BFX, 8BLT, 8BNJ, 8BNY, 8BOX, 8BOZ, 8BOM, 8BUM, 8BUN icw, 8BUQ, 8BUX, 8BXH, 8CAB, 8CAX, 8CBR, 8CGX, 8CLD, 9AS, 9CA, (9DV), 9EI, 9EK, 9EL, 9FM, 9GK, 9HW, 9IO, 9IZ, 9KP, (9LE), (9NX), 9OX, 9PI, 9PS, 9UK, 9VW, 9WC, 9WK, (9WU), 9XM icw, 9XAC, 9ZL, 9ZAC, 9ZAF, 9ZAI, 9AAS, 9AAV, 9AFD, 9AFF, 9AJA, 9AJP, 9ALS, 9AMU, 9AOF, 9APT, 9ARK, 9AWM, 9BBF, 9BED, (9BKZ), (9BLO dalite), 9BRL, 9BSG, (9DAM fone), 9DCF, 9DEH, 9DTA, 9DTS, 9DYN, 9DYQ, 9DZQ, Canadian (3KE), KDHW, KDKA fone, NMW, WBL fone, WDY fone, WHA, WOU icw, WXY fone, WUBC.

8VY, I. M. LOUWAERT, Kalamazoo, Mich. (February)

(1NE), (1XM), (2NZ), (3CM), (3EN), (3FN), (3ZY), (4BY), (4CO), (4FT), (4GL), (4YA), (5FV), (5ZA), (8CP), (8HJ), (8IH), (8QB), (8UK), (8YN), (8AIW), (8ALV), (8AVH), (8AXK), (8BDU), (8BEX), (8BLT), (8BLW), (8CGM), (8CLD), (9EK), (9FM), (9JL), (9KP), (9LE), (9PS), (9SJ), (9XI), (9XT), (9AAS), (9AFO), (9AIG), (9AJH), (9AJP), (9AUA), (9AVZ), (9AYS), (9BED), (9BJV), (9ADZ), (9DAZ), (9DTJ), (9DUN), (9DZQ), (9DZI), (9FLO), (9MDM), (9ZAC), (NOF), (WUBC).

8ZAE, B. P. WILLIAMS, 3220 Orleans Street, Pittsburgh, Pa. (February and March)

CW—(1AFV), 1AGI, 1ANQ, 1ARY, 1AWB, (1AZW), 1BAB, 1BKQ, 1BRQ, 1BH, 1BUA, 1CIK, 1DF, 1FF, 1II, 1PT, (1QP), 1QR, 1TS, 1UN, 1XM, 1ZE, 2AAB, 2AJW, 2AJF, (2AKO), 2AYQ, (2AWF), 2BG, 2BFZ, 2BGH, 2BEH, 2BNZ, 2BEB, 2BRB, 2BAK, 2BB, 2BEA, 2BML, 2BXP, 2CCU, 2CBG, 2FD, 2KP, 2NZ, 2SQ, 2VA, 2VH, 2WB, 2WP, 2XB, 2XJ, 2XI, 2YE, (2ZK), 3AAD, (3AAY), 3ALN, 3AQH, (3AQP), (3AQR), (3APA), 3AHK, 3AGN, 3ANY, 3AOU, 3ARY, 3ANJ, 3BZ, 3BHL, 3BLF, 3BG, 3BP, 3BEC, 3CA, 3CG, 3FM, 3FS, 3GH, (3HG), 3HJ, 3HQ, 3HEC, 3IQ, 3IZ, 3LR, 3NH, 3CM, 3SJ, 3RF, 3UN, 3VW, 3XAA, 3YV, (3ZO), (3ZY), 3ZAB, 4AS, 4BQ, 3BY, 4BF, (4DS), 4EN, 4EW, (4EL), 4EH, 4GL, 4HW, 4ID, 4II, 4XD, 4YA, 4ZE, 4ZF, 5DA, 5FY, 5FV, (5UU), 5ZA, 5ZAP, 6ZA, 6ZZ, (8AM), (8AQV), (8ADG), 8AXC, 8AXK, 8ASV, 8AWZ, (8AGZ), (8ARW), 8AWP, (8AWY), 8AVD, 8AMU, 8AND, 8AIM, 8AFG, 8ANJ, 8ABV, 8AOB, 8AMD, 8AQZ, 8AQI, 8AQF, 8AJD, 8AMF, 8AMW, (8BK), 8BAE, 8BOX, (8BCA), 8BQV, 8BMV, 8BMS, 8BEF, 8BBK, 8BXA, 8BZH, 8CAZ, 8CAE, 8CGT, 8CFS, 8CGY, 8CGX, (8CLW), 8EA, 8EM, (8GE), 8GV, 8HJ, 8IB, (8JL), 8JS, 8NI, 8NB, 8PT, 8QR, 8RH, 8SP, 8VY, 8XB, 8XAE, 8XE, (8YAC), (8ZZ), (8ZG), (8ZV), 9AL, 9AAV, 9AAS, 9AAY, 9APV, (9AJH), 9AKR, 9BRL, 9DAM, 9DTS, 9DYN, 9DTJ, 9HK, 9HW, 9KP, 9LQ, 9IO, (9PS), 9WK, 9DV, 9ZAF, 9ZG, 9ZL, (NMW), NOF, NSF, WOC, WHA, WWJ, WJZ, WBZ, WYCB, WBL, WDY, WGY, NZO, KDOW, KYW, (DF1), BF-5, AN-5, DM-7.

Spark—1AW, 1AEV, 1AYL, 1BEP, 1BOQ, 1CC, 1HO, 1OE, 2AS, 2AJE, 2BK, 2OM, 2QR, 2TF, 2TK, 2TP, 2WB, 3ALN, 3BA, 3BP, 3BFU, 3EA, 3FB, 3GO, 3FO, 3JL, 3JO, 3KG, 3HG, 3HJ, 3LI, 3QJ, 3US, 3XM, 3XT, 3XV, 3ZO, (3ZS), 4BQ, 4GN, 5AA, 5PY, 5XB, 5XK, 5XE, 5XA, 5XU, 5XS, 5YE, 5ZAA, 5ZAB, 7AN, 8AEA, 8AMZ, 8AXY, 8AKW, 8AWY, 8ABU, 8AYN, 8AHH, 8BEP, 8BIW, 8BUM, 8BXX, 8BKA, 8CEZ, 8CP, 8BCO, 8FI, 8IQ, 8QE, 8JJ, 8LB, 8LQ, 8LS, 8OI, 8PL, 8UC, 8VW' 8WE, 8WO, 8WZ, (8XE), 8XAE, 8YU, 8YV, (8ZA), 8ZAC, (8ZP), 8ZN, 8ZY, 9ACB, 9AAY, 9AAW, 9AVP, 9BPC, 9DFX, 9DZY, 9DHZ, 9DSO, 9DFZ, 9HJ, (9OX), 9PC, 9KI, 9LZ, 9SJ, 9WK, 9XAC, 9YA, (9YAE), 9YB, 9YQ, 9ZJ.

8ZG, A. J. MANNING, Salem, Ohio. (February)

Spark—1CK, 1AEV, Canadian 3GN, 3CA, 3DM, 3NB, 3TA, (3XM), 3ALN, 4BI, 4BQ, 4CX, 4EA, 4XC, 4YB, 5FJ, 5PY, 5SM, 5XA, 5XB, 5XC, 5XQ, (5XU), 5YE, 5ZO, 5ZZ, 8ZY, 9AP, 9HR, 9ME, 9MC, 9TL, 9UH, 9WT, 9XA, 9YC, 9YQ, (9ZJ), 9ACY, 9AGR, 9ANQ, 9DFX, 9DXM, 9DZY, (9YAE).

C W—1BH, 1MP, 1NE, (1TS), 1QN, 1AFV, 1ARY, 1AZW, (1BEA), 1BDI, 1BKQ, 1CGS, 2GR, 2OM, 2WB, 2WP, 2AAB, 2AAX, 2ADV, 2AFP, 2AKO, 2AYV, 2AZZ, 2BAK, 2BED, 2BFX, 2BFZ, 2BGM, 2BRB, 2CCD, 3BA, 3BG, 3CG, 3CM, 3EA, 3EM, 3FM, 3FS, 3FP, 3HG, 3HJ, 3HW, 3LQ, 3KM, 3LC, 3LR, 3PD, 3RF, 3RW, 3VA, 3ZO, (3ZY), 3AAD, 3ADT, 3AFU, 3AJD, 3ALN, 3ANJ, 3ASK, 3AQR, 3BIJ, 3BLF, 3CCD, (4BK), 4BQ, 4BT, 4BY, 4CA, (4EL), 4EN, 4FT, 4GL, 4ID, 4II, 4KK, 4LE, 4YA, 4ZC, 4ZE, 4ZF, 5DA, (5FV), 5JB, 5KU, 5NZ, 5QS, 5UU, 5YI, 5ZA, 5ZX, 6ZF, 7ZH, 8VY, 9AG, 9AZ, 9DV, 9EI, 9FM, 9GL, 9GO, 9HK, 9HM, 9HW, 9II, 9IO, 9KP, (9NS), 9NX, 9PG, 9PS, 9SJ, 9SS, 9QY, 9VD, 9WU, 9XI, 9XM, 9ZB, 9AAU, 9AAV, 9AFT, 9AJA, (9AKR), 9ANS, 9ANT, 9ARK, 9AUA, (9AXF), 9BBF, 9BED, 9BIK, 9BLO, 9BLY, 9BRL, 9DGM, 9DKI, (9DHB), 9DTJ, 9DWJ, 9DVA, (9ZAE), 9ZAF;

8YR, MIAMI UNIVERSITY, Oxford, Ohio. (February)

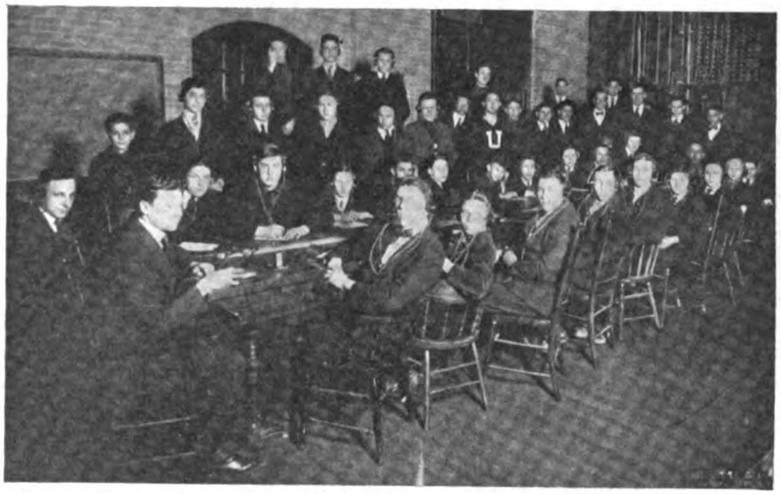
Spark—2BK, 2EL, 3GE Can., 3HJ, 3XJ, 3XM, 3XW, 3ZX, 5EW, 5PD, 5UC, 5XB, 5XU, 8AAR, 8AJT, 8AOH, 8AXY, 8CGZ, 8CHB, 8IN, 8SP, 8ZZ, 8XA, 8ZP, 9AEY, 9ASN, 9BOO, 9CA, 9DIW, 9JN, 9XI, 9YAE, 9YAK, 9ZX.

C W—1ARY, 1AZW, 1BAI, 1BDI, 1BES, 1BKQ, 1BUA, 1BWJ, 1COD, 1EZ, 1QN, 1XM, 1ZE, 2AAB, 2BAK, 2BTJ, 2FP, 2NZ, 3AAD, 3ADE, 3AEY, 3ALN, 3AQR, 3BA, 3BED, 3BNU, 3CM, 3EM, 3HJ, 3IZ, 3LR, 3RF, 3XAA, 3ZO, 3ZY, 4BQ, 4BY, 4EW, 4FT, 4GL, 4GU, 4KA, 4XD, 4YA, 5AAM, 5FV, 5JB, 5KP, 5NZ, 5UU, 5XT, 6ZZ, 8ADG, 8AGO, 8AGZ, 8AIO, 8ALB, 8AL, 8ALT, 8AOO, 8AQV, 8ARW, 8ASB, 8AVD, 8AWM, 8AWP, 8BK, 8BLW, 8BO, 8BOX, 8BSQ, 8BUM, 8BVT, 8BZJ, 8CAG, 8CFP, 8CLD, 8CW, 8GW, 8JU, 8OW, 8UJ, 8UK, 8VY, 8WY, 8ZZ, 9AJA, 9AKR, 9AMB, 9BED, 9BJV, 9BLO, 9BMD, 9DAM, 9DTW, 9DV, 9DYN, 9DZQ, 9FM, 9KP, 9LE, 9PG, 9PI, 9PS, 9WD, 9XAI, 9XAQ, 9ZAC, 9ZAF, 9ZE.

Phone—2XAI, 2XJ, 9XM, 9ZAF, NOF, KDKA, KDOW, KUXV (Avalon), KYW, WBL, WBZ, WHA, WJZ, WRR.

8XU, NEWTON O. BURNETT, Cornell University, Ithaca, N. Y. (February)

4BA, 4BQ, 4BT, 4CO, 4CX, 4DC, 4EU, 4EW, 4FT, 4GL, 4JE, 4YA, 4YB, 5AAM, 5DA, 5DO, 5EK, 5FV, 5HK, 5JB, 5NZ, 5UU, 5XB, 5XU, 5ZA, 5ZAK, 5ZAP, 5ZU, 6XAD, 6ZF, 6ZZ, 7ZM, 9AAP, 9AAS, 9AAU, 9AAV, 9ACB, 9ACE, 9ACY, 9AEK, 9AAF, 9AFT, 9AIR, 9AJA, 9AJH, 9AJP, 9ALP, 9ALS, 9AMR, 9AOU, 9ARG, 9AS, 9OAU, 9AUA, 9AVN, 9AVP, 9AWN, 9AXF, 9AXU, 9AYH, 9AYS, 9AZX, 9BBF, 9BDI, 9BED, 9BHE, 9BIK, 9BJV, 9BKZ, 9BLO, 9DV, 9DWP, 9DY, 9DYU, 9DZI, 9FM, 9HW, 9HY, 9JL, 9JN, 9KP, 9LE, 9LF, 9LW, 9NX, 9OX, 9OU, 9PG, 9PS, 9RC, 9SJ, 9UU, 9VAE, 9VE, 9WS, 9WT, 9WU, 9XAE, 9XAQ, 9XI, 9XM, 9YA, 9YAE, 9YAJ, 9YB, 9ZAC, 9ZAF, 9ZJ, 9ZL, 9ZN, 9ZT, 9ZV, 9ZX, 9BP, 9BPG, 9BRL, 9BSC, 9BVL, 9CA, 9CJ, 9DAX, 9DCK, 9OES, 9DF, 9DGE, 9DHB, 9DHZ, 9DIW, 9DNG, 9DSO, 9DTN. Ones, twos, threes, and eights too numerous to mention.



A class of radio students at Union College, Schenectady, N. Y.

8BXX, HOMER FORSCHMER, 7 Ford Ave., Norwalk, Ohio. (1 tube) (February)

Spark—1ARY, 1BVK, 2AZY, (2GK), (2JZ), 2OM, 3AJD, 3DM, 4CG, 5BY, (5HK), 5PE, 5PY, 5SM, 5TU, 5UC, 8AAD, (8AIT), 8AMK, 8ANO, (8AOI), (8ARS), 8AFG, (8ASL), 8AVT, 8AWT, 8AXC, (8AXN), (8AYX), (8BIU), 8CGJ, 8CKR, 8EB, 8LB, 8UC, 8WO, 8YV, (9AAW), (9AFK), (9AGR), (9AIG), (9AJH), 9ALM, 9ALO, (9ALU), 9AOG, 9AOJ, (9APH), (9APK), 9AQM, (9AR), (9ARZ), (9ASJ), (9AVX), 9AYW, 9AZF, 9BCF, (9BDC), 9BHM, 9BMN, (9BP), 9CP, 9CN, (9DEL), 9DHZ, 9DKQ, 9DKV, 9DLQ, 9DNC, 9DNI, (9DPB), 9DQQ, (9DSD), (9DWX), 9DXT, (9DYY), (9DZE), (9DZI), 9FK, 9IB, 9IF, (9IV), (9KI), 9LF, 9TU, (9UU), (9VL), 9WH, (9WT), (9WX).

CW—1ARY, (1BKQ), 2BNZ, 2FP, 3AQR, 4DS, 6XAD, (8ABO), 8AHR, (8AXK), 8BBK, 8BJC, 8BNY, 8BZO, 8CAZ, (9AAV), 9AJA, 9AJH, 9AJP, 9ALS, 9DCR, 9PS, AN5 fone, WJZ, WBL, KDKA, KDOW.

9ZG, A. C. MERTZ, Mt. Carroll, Ill. (March)

CW—1ARY, 1BCG, 2BCH, (2BFZ), (2BGH), 2BIS, (2SQ), (2ZV), (3BZ), (3CA), 3CM, 3FS, (3ZO), (3ZY), 4BK, (4BQ), 4BY, 4CY, (4EL), 4FT, (4YA), 5FT, (5FV), 5HK fone, 5KP, (5ZA fone), 5ZV, 5ZY, 6ZF, 6ZG, 8AGZ, 8AQE, 8AQV, 8ARW, (8AWP), 8AWY, 8BEQ, (8BFX), 8BOX, 8CFS, 8BO, 8EB, 8GE, 8ZB, (8ZG), (8ZZ), 9AAS, 9AAY, (9AFF), (9AFN), (9AJA), 9AKD, (9AMB), 9ABJ, 9ARO, 9AUA, 9AWM, (9BED), (9BIG), 9DKQ, 9DQM, 9ZAF, 9FM, 9HK fone, 9ID, (9NX), (9WC), (9ZE), (9ZY).

Spark—3XM, 4BQ, 5BY, 5EK, (5FO), 5HK, 5IS, 5XB, 5XJ, (5XU), 5ZL, 5ZZ, 8BEP, 8FG, 8FI, 8NZ, 8UC, 9ACH, (9ACL), 9AEG, 9AOJ, 9AQE, 9ASF, 9AUH, 9AWX, 9AYW, 9AZA, 9BHD, (9BJA), 9BUO, (9AXO), (9DFX), (9DHD), 9DQQ, 9DUG, (9YAK), (9CS), (9EE), (9GC), (9MS), 9YN.

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Owing to lack of space in this issue of THE WIRELESS AGE the List of Amateur Station Calls will be published in the May issue

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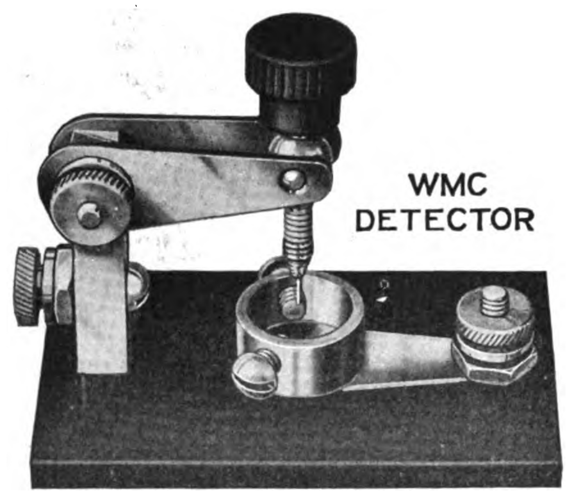

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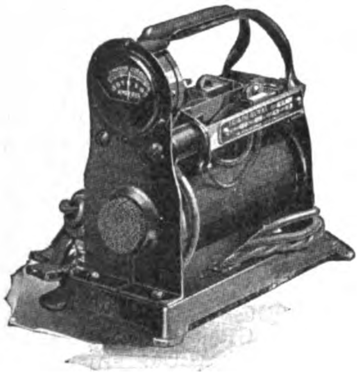

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Positively no questions answered by mail.

H. W., West Concord, Minn.

Q. 1. Will it make any difference in the strength of signals received, if the aerial is close to lightning rods?

Ans. 1. No appreciable effect.

Q. 2. What makes the squealing and whistling in receivers?

Ans. 2. Probably due to improper tuning of your receiving set.

E. T. C., Highland, N. Y.

Q. 1. What type of tuner using three honeycomb coils is most effective?

Ans. 1. Standard wiring diagram employing primary, secondary and tickler coils.

Q. 2. May a given type of amplifier be used just as efficiently for short wave length as long? Ans. 2. Yes.

Q. 3. Please publish formula for determining the wavelength?

Ans. 3. Approximately 4.4 to 4.8 times the total length of the aerial from the extreme far end to the apparatus.

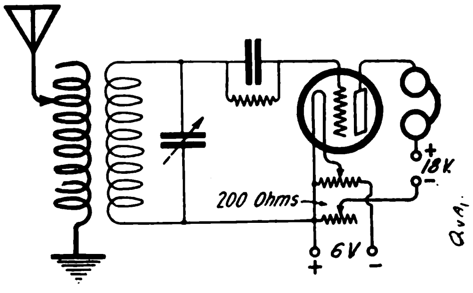
M. B., Canajoharie, N. Y.

Q. 1. Dr. Goldsmith in his book Radio Telephony refers to the Dieckmann Electrostatic shield. Is there any description of this shield published?

Ans. 1. We are unable to ascertain the location of any exact constructional data as this electrostatic shield has not been applied commercially. Its construction would necessitate considerable experimenting but will undoubtedly repay you for the time spent.

C. H., Moorhead, Minn.

Q. 1. What is the most satisfactory way of varying the "B" battery voltage, either potentiometer or switching arrangement. Does a potentiometer shorten the life of the battery?



Ans. 1. This is the most satisfactory circuit for use in connection with the UV-200 detector tube. The adjustment is very critical but when used the results are surprising. A tapped B battery does not permit of close enough adjustment. The adjustment of the A battery current and B battery potential are both very critical. The potentiometer in this case will not affect the life of either A or B batteries.

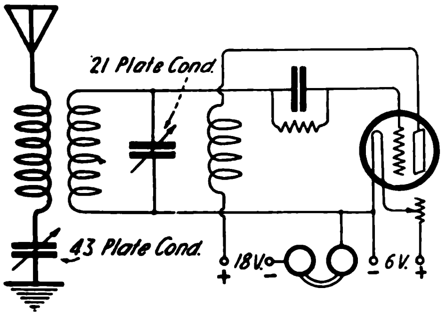
Q. 2. Could you give me some simple directions for the winding of an efficient duolateral coil?

Ans. 2. We are unable to give you any data on these coils as it has not been released by the manufacturers. Hints on this subject have appeared in previous articles of this magazine.

Q. 3. Please give me specifications—number of turns and gauge of wire, and number of coils needed to receive the shortest wavelengths up to those emitted by the Long Island station. Ans. 3. See above.

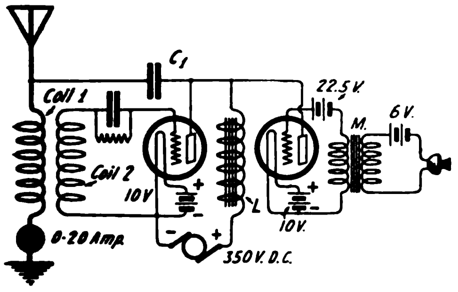
Q. 4. Please give the best circuit using 1 bulb; 2 variable condensers, (21 and 43 plate); 1 fixed condenser and a set of three coils. Including the proper batteries and resistances.

Ans. 4. Here is your diagram:



G. S. H., Suffolk, Va.

Q. 1. Would you be so kind as to give the writer detailed specifications for the building of the radiophone as per the sketch shown on page 31 of the January, 1922 issue of The Wireless Age; that is, a list together with the capacities, inductances, etc., of the different parts? I expect to use two five-watt Radiotron tubes.



Ans. 1.
Coil 1, 25 turns spaced ½"-6" diameter.
Coil 2, 25 turns spaced ½"-5" diameter.
C_1—.002 mfds.
L.—1½ Henry Choke.
M.—Any standard microphone transformer.
R. C. A. UP 414 is designed to be used with the UV 202 tubes.
Leak—2500 or 5000 ohms.
Grid Condenser—.002 mfds.

F. R. K., Bremerton, Wash.

Q. 1. Why are the systems shown in Fig. 1A, 1b, Fig. 2a, Fig. 2b and 2c not successful?

Ans. 1. These are only satisfactory in the case of very small power outfits on account of the fact that microphone is in the high potential circuit and is required to handle considerable current which would result in burning out the microphone if used with larger outputs.

Q. 2. Why are they not used very much? Ans. 2. See answer No. 1.

Q. 3. What are the disadvantages? Ans. 3. See answer No. 1.

Q. 4. What is the most satisfactory tuner, the loose coupler or coils?

Ans. 4. Either will work well if handled properly.

I. S., Coshocton, Ohio.

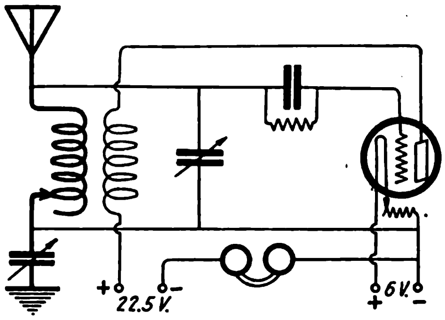
Q. 1. I would like to build a 5-watt vacuum tube transmitter, but having 32 volt direct current from a farm lighting plant, I do not know just how to build the transformer to suit this current.

Ans. 2. In this case you would have to employ a motor-generator as D. C. cannot be stepped up or down by a transformer. You may use the batteries to light the filament of your tubes. Be sure the voltage is correct.

T. W., Grass Valley, Calif.

Q. 1. I have a loose coupler, rheostat, socket, grid leak, grid condenser, A and B batteries. I have used several hook-ups but I cannot hear any telephone stations although I am but 40 miles from three large stations. Kindly give hook-up to receive telephone stations with the above instrument using either a Radiotron or Cunningham U. T. 1.

Ans. 1. Here is your diagram:



Q. 2. How is a regenerative coupler made? I have seen this shown in many loose coupler hook-ups. The hook-up No. 4, page 27 of the October, 1920 issue of The Wireless Age shows one.

Ans. 2. There are a good many types of couplers using three coils for regenerative reception but the hook-up given in the previous answer will regenerate with the ordinary loose coupler. You would do well to use both variable condensers but the circuit will work without either, although results will not be as satisfactory.

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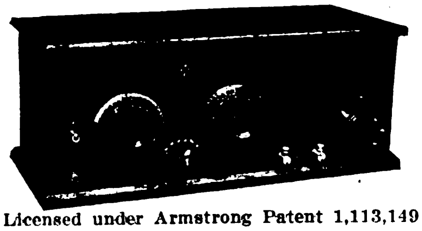

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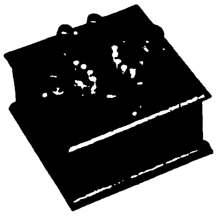

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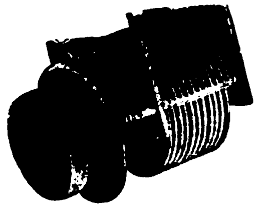

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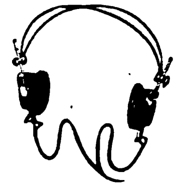

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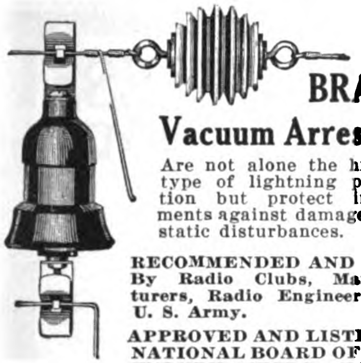

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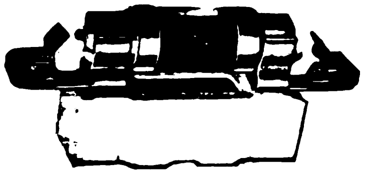

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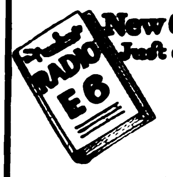

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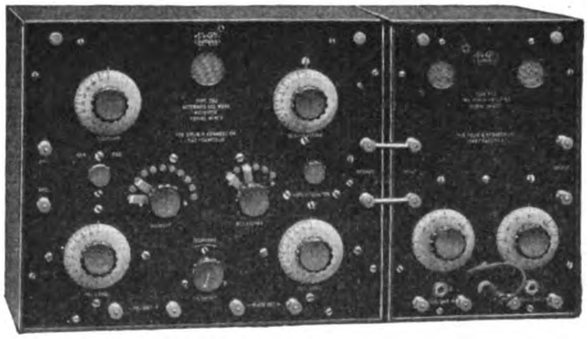

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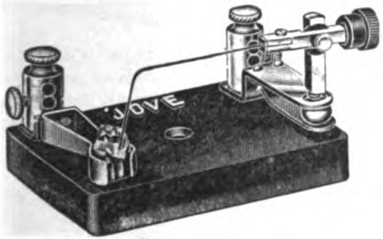

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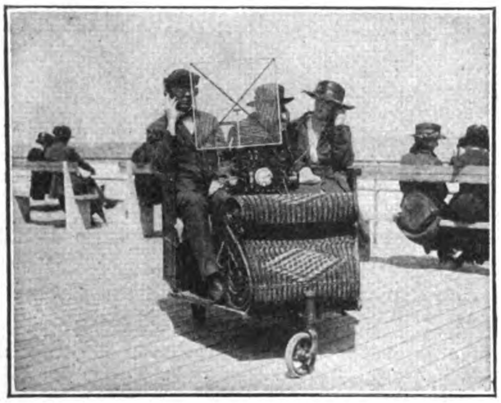
"NO AERIAL ON THIS HOUSE"

don't allow his QRM to worry you but purchase a

WARREN RADIO LOOP

The LOOP that made the Radio Roller Chair famous on the Boardwalk at Asbury Park, N. J.

Is just the thing for an apartment or den.
Is light in weight and easily portable.
Is produced under a new principle of winding.
Is wholly enclosed, thereby protecting the winding.
Is used in place of an outside aerial.
Is a regular indoor aerial.
Is adapted for receiving in moving vehicles.
Takes the "tic" from static.
Eliminates all danger from lightning.
Can be used without tuner.
Can be used with any receiving instrument.



This picture of the Radio Roller Chair showing the WARREN RADIO LOOP was used as cover designs on "Wireless Age" and "Radio News" and featured in many other magazines and newspapers in the United States.

Send your order through your dealer or direct to us with his name.

Type-A-737	(300-700 meters)	$10.00
Type-A-7236	(175-1000 meters)	$12.00

V-DE-CO RADIO MANUFACTURING CO.
Dept. W, Asbury Park, N. J.
Send for Bulletin No. M-101

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Whether you are interested in a complete radio receiving outfit, or a half a dozen binding posts, you'll find the particular instrument, best for your needs, in Corwin's Catalogue. Send 10c, *(credited to your first order)* for your copy today! Where's the nearest mail-box?

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Send Now
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OPERATING KINEMA THEATRE RADIOPHONE
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IN GREAT DEMAND BY WIRELESS OPERATORS

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The Genuine Old Style Single Lever Improved Martin Vibroplex is in great demand by experienced wireless operators because it transmits Clearer, Faster signals than is possible on the ordinary key, and because it reduces muscular effort to the minimum.
This world-famed sending machine holds all long distance sending records in land, cable and radio service. In addition to the features which made these records possible, the IMPROVED VIBROPLEX embodies a number of improvements designed to make it even more valuable to wireless operators.

NEW AND IMPROVED FEATURES

Improved Trunnion Lever
Extra Heavy Contact Points Throughout
Convenient Size
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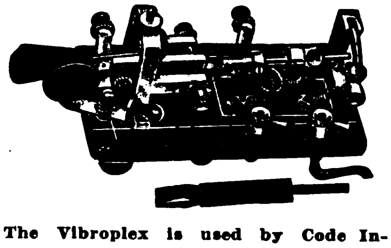
Whether actively engaged in Radio service or an experimenter, you'll need the IMPROVED VIBROPLEX to complete your equipment. BUY NOW!

Japanned Base - $17.00 Nickel-Plated Base - $19.00
Remit by Money Order or Registered Mail

THE VIBROPLEX COMPANY, INC., Dept. WA, 825 Broadway, New York



The Vibroplex is used by Code Instructors of Radio Institute of America, (formerly Marconi Institute), America's Foremost School for Instruction in Radio Telegraphy, in Teaching Code Reception.

ASK ANY EXPERIENCED WIRELESS OPERATOR

J. E. ALBRIGHT, President.

DON'T IMPROVISE—PACENTIZE!

If you still fuss around with binding post connections, you have not seen or heard about the Pacent Combination. You can change connections in a jiffy with the Pacent Universal Plug. The Pacent Twin-Adjuster and the Pacent Multijack.

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This plug was the first radio plug to make an appearance and it remains the first radio plug in quality. A solderless, biting contact is made which will not give rise to disturbing noises. You can use the Pacent Plug with 'phones, Duo-Lateral Coils, microphones, keys, etc. The Pacent Plug fits any jack. With its soft, velvety black finish it will add a touch of beauty to any receiver.

Catalogue No. 50 PACENT UNIVERSAL PLUG, Price $1.25

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You can't put two plugs in a single jack, but you can make a single jack serve the purpose of two jacks with a Pacent Twin-Adapter. Just insert the Twin-Adapter and presto!—the usefulness of the jack is multiplied by two. Just the thing to use with a loud speaker; tune with the 'phones and then plug in the loud speaker. The Twin-Adapter has a multitude of uses in C.W. work.

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Another worthy member of the Pacent plug and jack combination is the Pacent multi-jack. This is really three independent jacks built into a beautiful composition base. Screwed to the side of a receiving outfit it will allow three sets of 'phones to be plugged in or two sets of 'phones and a loud speaker. It may also be screwed to the table or the testing board. All standard plugs will fit into it, but it was designed especially for use with the Pacent Universal Plug or Pacent Twin-Adapter.

Catalogue No. 52 PACENT MULTI-JACK, Price $1.50

Send for a Copy of circular N 100

See the Pacent Radio Essentials at your dealers. *Dealers and Jobbers—Write for our sales plan*

PACENT ELECTRIC COMPANY

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A perfect rectifier at last, fully automatic and foolproof in every respect. It can be operated by anyone.

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connects to any alternating current socket, gives a taper charge—will fully charge any "A" battery overnight. It is self-polarizing. Connect your battery either way and it will always charge. Automatically disconnects battery when power is interrupted. Restarts charging when connections are restored. Adjustable for wave form, frequency and voltage. Contains only one moving and two wearing parts, lasting thousands of hours, replaceable as a unit for $1.00. **The highest charging rate, greatest efficiency, and simplest of any rectifier selling for less than $100.00.** Bulletin 628 proves it. Ask for your copy. Manufactured in sizes for charging three or six cell batteries from both alternating and direct current circuits. Cannot injure battery—will last a lifetime—approved by underwriters—satisfaction guaranteed. For sale by all radio, electrical and accessory dealers or shipped express prepaid for purchase price—$18.50 ($20 west of Rockies.)

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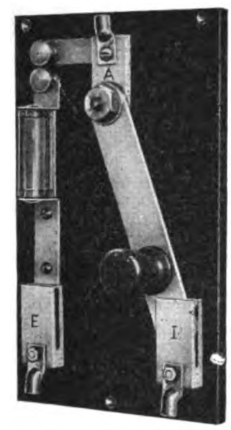
Herewith 6 cents in stamps to pay mailing expense on my copy of your latest booklet.

W-4-2



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Thordarson—Shielded	4.00
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Benwood No .14 Spec. per 100 ft.	$ .35
7 strands No. 22, per ft.	.01
7 strands No. 20, per ft.	.1½
Aeroplane Special, per 100 ft.	.50

AUDION CONTROL PANELS

Remler	$8.00
Acme	10.00
Paragon	6.00
Benwood	9.50

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Burgess small 22½ V.	$ 2.25
Burgess tapped 22½ V.	2.75
Burgess large 22½ V.	3.00

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Benwood test buzzer	$ .60
Century high frequency	2.50

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Benwood Universal Grid condenser and leak	$ 1.00

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Chelsea No. 1 Unmounted	4.75
Chelsea No. 2 Mounted	4.50
Chelsea No. 2 Unmounted	4.25
Murdock No. 366	4.75
Murdock No. 368	4.00
DeForest Knocked down	3.75
DeForest Knocked down Large	4.75

CRYSTAL DETECTORS

Murdock	.60
DeForest (dustproof)	2.60
Galena and silicon	.25

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Benwood Nickel or Brass Metal with knob	$ 1.50
Chelsea Dial and Knob	1.00
Clapp-Eastham Dial and Knob	.75
Tuska Dial and Knob	1.50
Corwin (large)	1.50

SEND FOR CATALOG
Send 10c in stamps for the new Benwood Radio Catalog, comprising latest price directory.

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Electrose (ball type)	$ .35
Electrose 4 in.	.45
Electrose 10 in.	.85

JACKS

Federal, open circuit	$ .70
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Federal, with filament control	1.50
Federal, Double Circuit	1.00
Rhamstine Double Circuit	.85

PLUGS

Firth Bull Dog Grip	$ 2.50
Federal	2.00
Pacent	2.00

RHEOSTATS

Fada (filament)	$ 1.00
Fada (power)	1.35
General Radio	2.50
DeForest	1.65
Clapp-Eastham (panel)	.90
Murdock (panel)	1.00
Remler	1.00
Paragon	1.50

SOCKETS

Benwood (bakelite) panel. or table mounting	$ 1.50
Remler (bakelite)	1.50
Rhamstine (bakelite and metal	$1.00
Murdock Moulded	1.00
General Radio Moulded	1.50
Crosley (porcelain)	.60

Dealers: Write for our proposition

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Baldwin Type "C"	$12.00
Baldwin Type "E"	13.00
Baldwin Type "F" small	14.00
Baldwin single "6" unit for loud speakers	6.00
Murdock No. 56 2000 ohm	5.00
Murdock No. 56 3000 ohm	6.00
Brandes Superior	8.00

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Benwood assembled	$5.00
Benwood knocked down	4.00
Clapp-Eastham	5.75
Remler Moulded	6.00

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Clapp-Eastham	6.75

VACUUM TUBES

Cunningham UV-300	$ 5.00
Cunningham UV-301	6.50
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A-P detector	5.00
A-P amplifier	6.50

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(Any Style Made)

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Federal (hand)	7.50
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THE BENWOOD CO., Inc. St. Louis, Mo.
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Edison

RADIO BATTERIES

Operators and experimenters who demand the best radio equipment obtainable can now have *EDISON BATTERIES* built of the same materials as the thousands performing so satisfactorily in the service of the ARMY and NAVY.

Edison Radio Batteries are built of steel and have an alkaline electrolyte. They are strong, clean, long-lived and have exclusive electrical features that are highly desirable in radio service.

THE EDISON RADIO CELL OPERATES SILENTLY. The voltage curve is flat, at the rate generally used. The terminals are convenient for "tapping in."

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6 volts, 37.5 ampere hours - -	**$42.50**
6 " 75 " " - -	**58.75**
6 " 112.5 " " - -	**80.00**

for plate circuits:

2½ volts, 2½ ampere hours -	**$ 2.50**
22½ " " " " -	**22.50**
Tray - - - - - - - - - - - - - -	**1.50**
22½ volt battery, complete - -	**$24.00**

All prices f. o. b. Orange, N. J.

Edison Radio Batteries can be furnished for any required voltage; prices of other assemblies on request.

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TYPE 156 SOCKET

The experimenter who has had previous experience with the assembly of receiving and transmitting sets has learned the necessity of having every unit perfect. Entirely aside from the gain in efficiency, he has found the advantage of using apparatus in which the greatest care has been given to construction details.

General Radio apparatus is designed with this end in view. A noteworthy example is the Type 156 Vacuum Tube Socket.

This socket is adapted to any of the standard American four-prong transmitting or receiving tubes. It is adapted to the Western Electric VT-2 tube, as well as to the Radiotron UV-200, 201 or 202 tubes. The contact springs are sufficiently rugged to carry the filament current of the five-watt transmitting tubes without arcing.

Price $1.50

This is but one example. Others are Amplifying Transformers, Modulation Transformers, Tuning Inductances, Hot Wire Meters, etc. SEND FOR FREE BULLETIN 910W describing these and other instruments.

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Standardize on General Radio Equipment Throughout
CARRIED BY LEADING DEALERS

Here You Are Fellows!
Just what you have been waiting for

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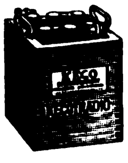
Complete list of all Amateur Stations in the United States including Special and Broadcasting Stations. Notes on Construction of Receiving Set and Calibration of Wavemeter.

Dealers Write **Price $1.00** Dealers Write

Wireless Press, Inc., 326 Broadway, New York



Keco-Radio Storage Batteries
Are the highest grade batteries built especially for wireless instruments.

Solid oak box, natural finish, highly varnished. 6 volt, 7 heavy "Cristal" plates per cell, 50 amps.

We are one of the largest builders of exclusive high grade Wireless Batteries in the country. Thousands in use. Sold by all leading dealers or shipped direct from factory, $15.00, with book of uses and abuses of the storage battery.

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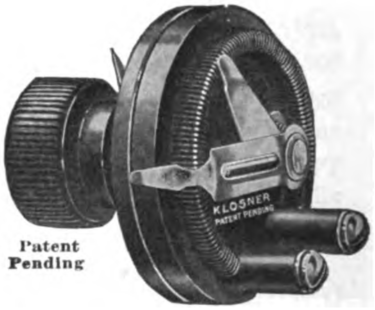
The KLOSNER Vernier Rheostat



Patent Pending

Is the only Vernier Rheostat made having the exclusive feature of using but

One Single Knob

for both rough and fine adjustments. This feature allows the symmetrical appearance of the single knob to be retained when mounted on a panel with other instruments, and, at the same time adds to the simplicity and ease of operation in obtaining the necessary fine adjustments for best results from the modern critical vacuum tubes, especially when receiving phone and C. W. signals. We invite comparison with any other filament rheostat now made. Look for the name "KLOSNER" moulded on the base.

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Shipping Weight One Pound

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—the amplifier used by the U. S. Navy. "Use the tube the Navy uses."
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Equipped with the SHAW Standard four-prong base.

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—the most sensitive detector of spark signals known to the radio art.
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A-P Tubes are licensed by the Radio Corporation of America under the DeForest Audion and Fleming patents for amateur and experimental use in Radio communication. Equipped with SHAW standard four-prong base.

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TUBES
are the
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that paved the way over which radio has advanced to its present status of universal usefulness; and progressing the meanwhile with the industry, have been fundamental factors in achieving new radio development and maintaining continued expansion. These tubes are the tubes you should use—*"the tubes that are used by those who know."*

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1915 First regenerative receiver ever manufactured bore the name PARAGON.

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1916 First Trans-continental Amateur Transmission (New York to California; not pre-arranged) effected by PARAGON designed transmitter.

1917-1918 PARAGON acknowledged supreme on Western Front.

1921—First Trans-Atlantic Amateur reception effected with PARAGON receiving equipment, at which time 27 different amateurs scattered thruout the Eastern section of the United States registered signals at Ardrossan.

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Manufacturers
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Type 222 Price $75.00

A Tuska Wireless Receiving Set for the Home. You make no mistake in demanding

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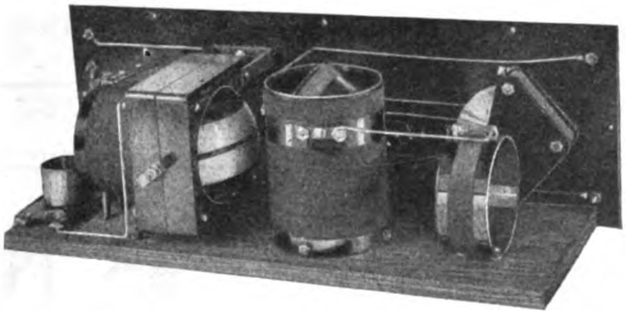
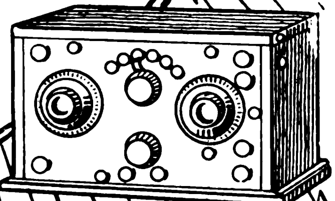


The C. D. Tuska Company
26 Hoadley Place
Hartford, Conn.



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Amplify your signals with ACME Transformers

SPECIALIZATION in building transformers as in all other lines results in a high degree of efficiency. Whether you build your own apparatus or buy assembled outfits insist on the use of proven units. Acme Transformers in your vacuum tube amplifier equipment magnify voice and music as well as code without distortion and without howling. They are priced as low as specialized quantity production permits, with due regard for quality. At all Radio dealers.

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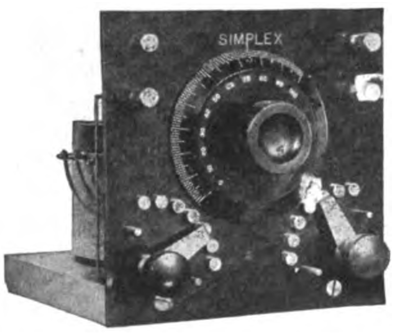

The Simplex Vario-Coupler Panel Mounted makes an ideal short-wave tuner for the beginner, when used in connection with a variometer or variable condenser in the secondary circuit.

Vario-Coupler, Panel Mounted, as illus.	$11.50
Vario-Coupler, Unmounted..........	6.00
Variometer, Panel Mounted	9.75
Variometer. Unmounted............	6.00

If your dealer does not have them, he will get them for you.

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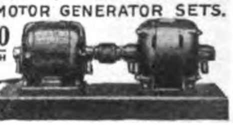

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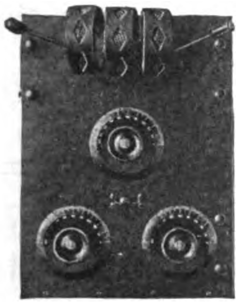
between two covers.

DUCK'S New Radio Catalog No. 16
275 pages -- A Catalog De Luxe

NEVER in the history of radio was such a catalog printed. The radio data and diagrams, embracing upwards of fifty pages, gives the experimenter more valuable and up-to-date information than will be found in many text books selling for $2.00, and $1.00 could be spent for a dozen different radio catalogs before you could gather together the comprehensive listing of worth while radio goods found in this great catalog.

Type "Q"
Receiver



An Ideal Receiving Set for Long and Short Wave and Radio Telephone Reception

This set is the most flexible receiving set on the market. With the use of the various sizes of Honeycomb Coils everything in the range of radio telegraph and telephone reception from 200 to 25,000 meters is brought into your home. Consists of a three coil mounting, and three Variable Condensers of proper capacity. Tuning extremely sharp. Remler dials.
Price without detector **$35.00**
Price with detector **$40.00**

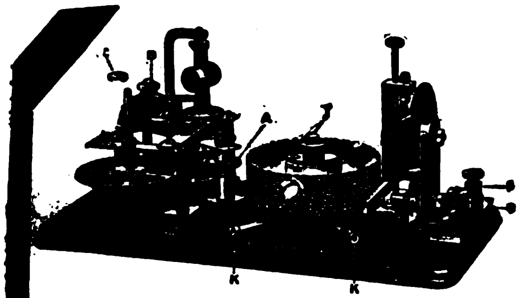
A Brief Summary of the Radio Goods Listed in This Catalog

The entire radio catalog of the Radio Corporation, with a wealth of scientific and technical data on C. W. Transmitting sets, and all the diagrams for the assembling of these sets; the complete Remler catalog, which embraces 25 pages, the Westinghouse, Firth, Murdock, Federal, DeForest, Clapp-Eastham, Brandes, Connecticut Company, Thordarson, Turney, Magnavox Company catalogs, the best products of the Adams-Morgan, Signal and countless other manufacturers, including our own complete line of radio apparatus, and many individual items and parts used in radio work today.

THE WILLIAM B. DUCK COMPANY, 239-241 Superior St., TOLEDO, OHIO

Learn The Code
With The OMNIGRAPH

The **Omnigraph** Automatic Transmitter will teach you the Code—at home—in the shortest possible time and at the least possible expense. Connected with Buzzer or Buzzer and Phone, the **Omnigraph** will send you unlimited Continental messages, by the hour, at any speed you desire. It will bring an expert Operator—right into your home—and will quickly qualify you to pass the examination for a first grade license.



4341 Richardson Ave.,
New York City
Jan. 21, 1920.

THE OMNIGRAPH COMPANY,
Cortlandt Street, New York.

Gentlemen:—I wish briefly to commend your very excellent Automatic Transmitter. Recently I was successful in obtaining a first-class Commercial Radio License and I believe that the Omnigraph was my principal aid.

I took a four weeks course at a resident Radio School in Theory only. I relied on the Omnigraph to get my code to the proper speed, and the Omnigraph did it.

I was one of two in a class of eighteen to obtain a first-class License. The stumbling block for the others was CODE . . . . and I know that a short time receiving Omnigraph messages daily would have enabled them to pass the examination as easily as I did.

I believe the Omnigraph to be the easiest, quickest and cheapest method to learn the International Morse Code.

Cordially yours,
(Signed) GEO. B. SELLERS.

The **Omnigraph** is used by several departments of the U. S. Government and by a large number of the leading Universities, Colleges, Technical and Telegraph Schools throughout the U. S. and Canada.

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Thousands have learned both the Morse and Wireless Codes with the **Omnigraph.**

Send for free catalog describing three models—$14 to $30. Do it today. The **Omnigraph** is sold under the strongest of guarantees—if not as represented, your money back for the asking.

THE OMNIGRAPH MFG. CO., Dept. C., 16-22 Hudson St., N. Y.

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2200 OHMS $8.00 POST PAID

3200 OHMS $10.50 POST PAID

An exceptional Value—Made Possible by quantity production:

SPECIAL—For $1.50 Extra, we will equip either headset with a $1.75 Federal Universal Plug.

Dealers: We can supply you, too.

Our 25c "ADD-A-PAGE" Catalog is free with every cash purchase.

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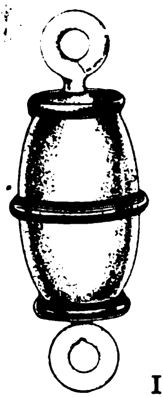

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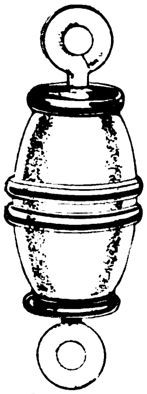

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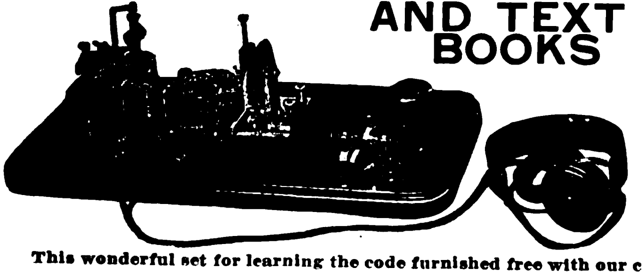

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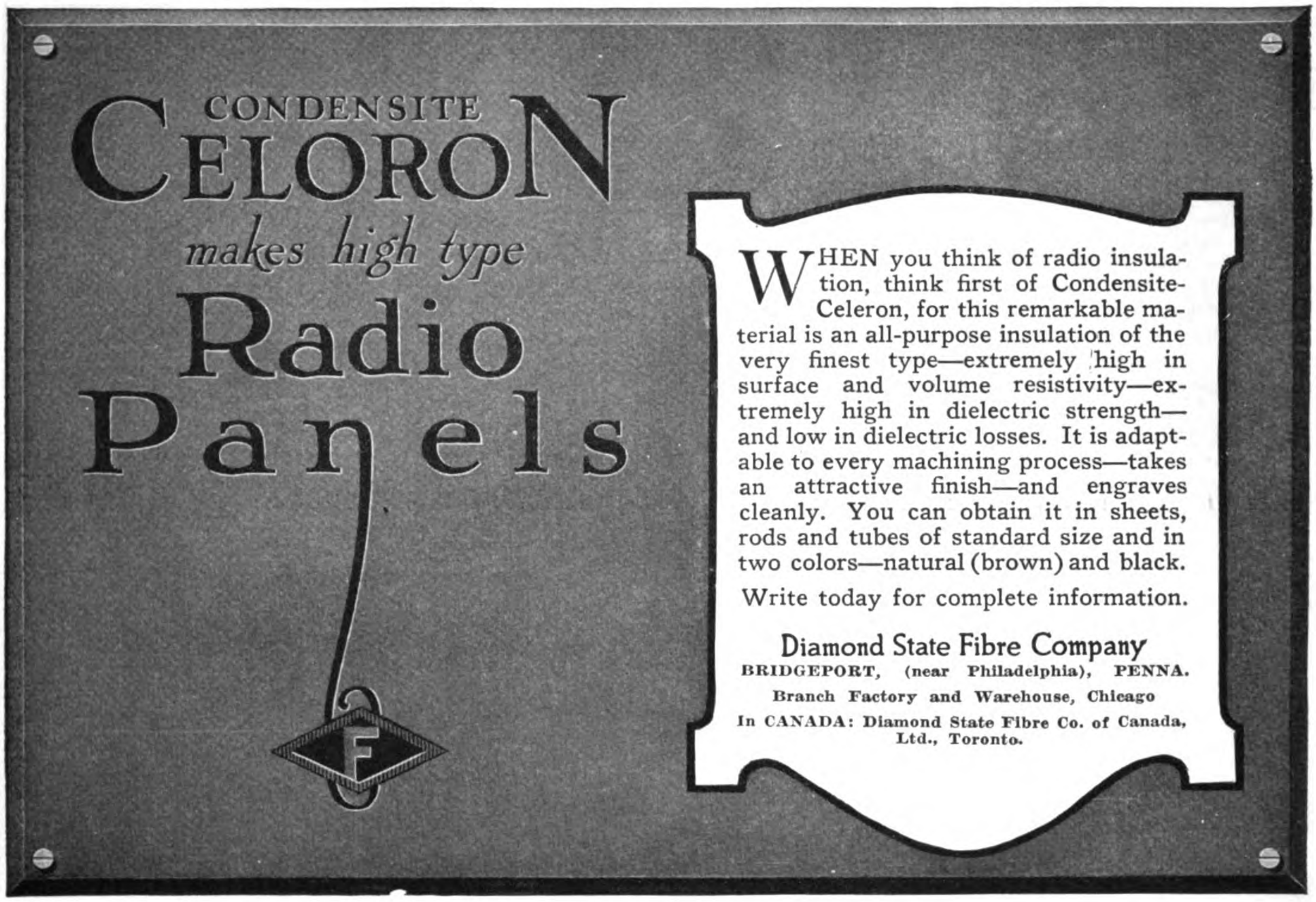

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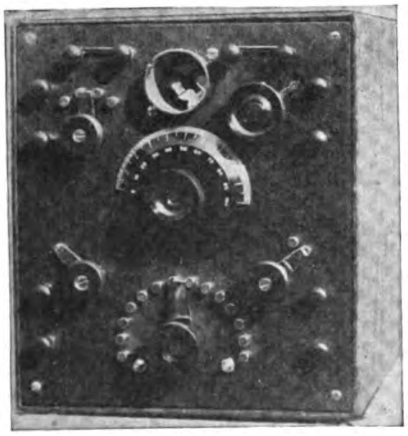

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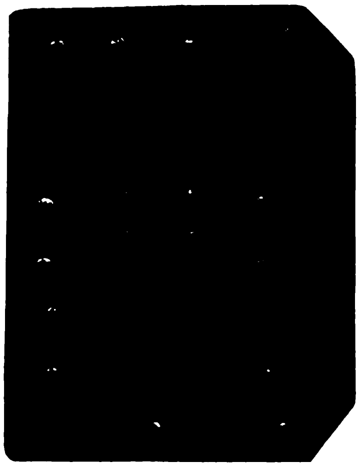

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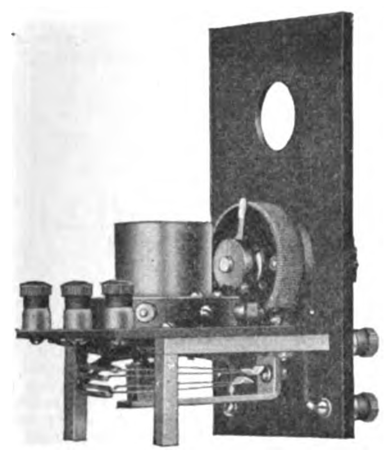
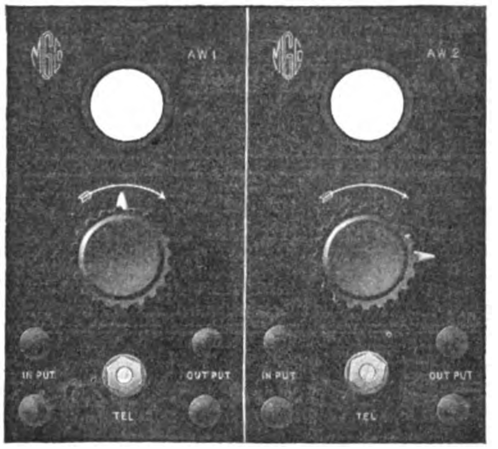


Detector—Rear View

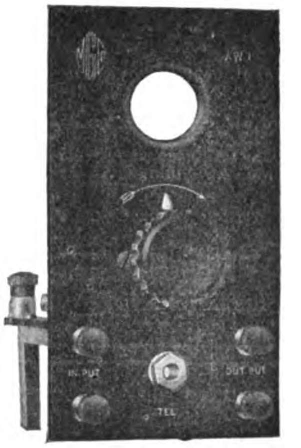
Detector

These new Detector panels incorporate the latest developments in instruments of their kind and have that distinctive touch, characteristic of Marshall-Gerken products. These units match perfectly with our amplifiers.

Type A. W. 1-0 in individual cartons, each $11.50. Equipped with Standard Federal Jack.



Detector-Amplifier Combination



Detector—Front View

Amplifier

The Amplifier units, made to match with the new detector panels, are identical in their design and construction with the addition of an amplifying transformer that has been built to our own specification. Two of these units are sufficient to use with any loud speakers.

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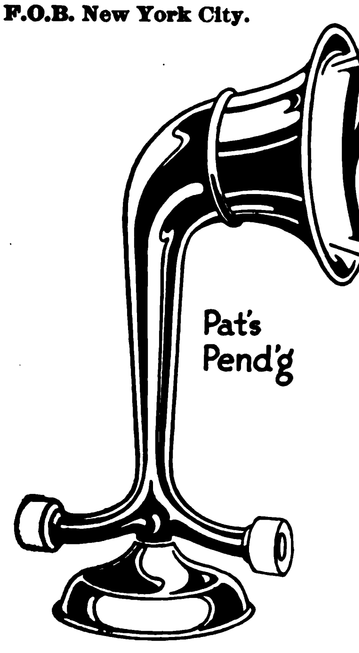

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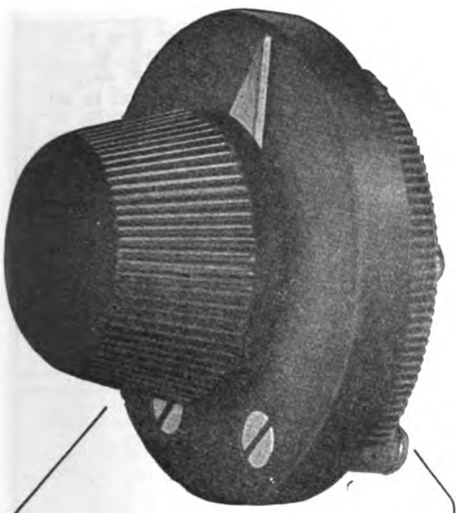

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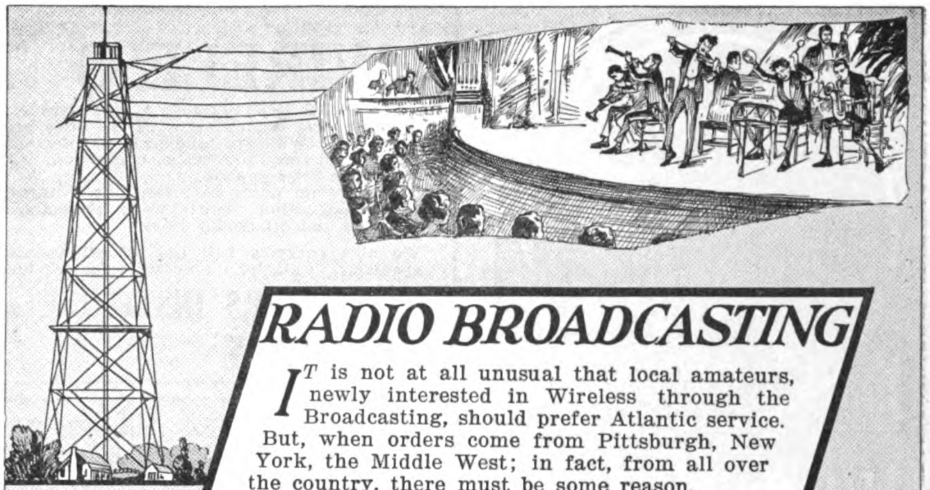

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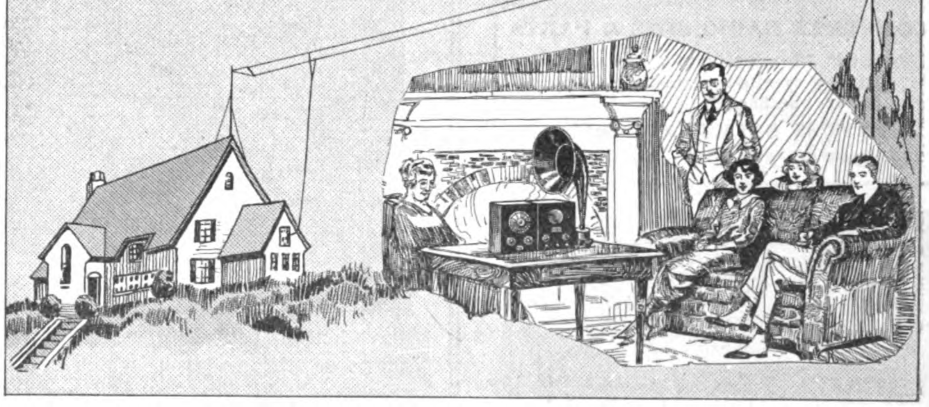

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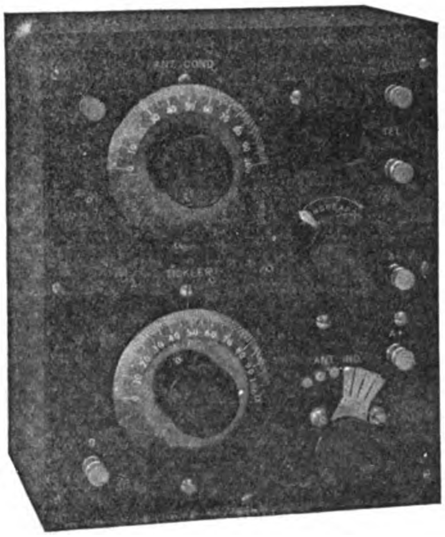

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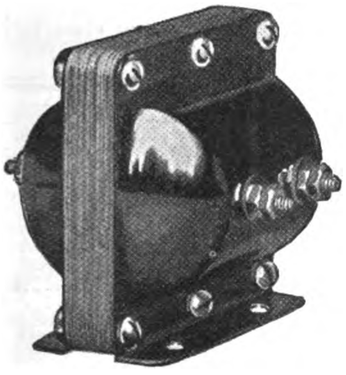

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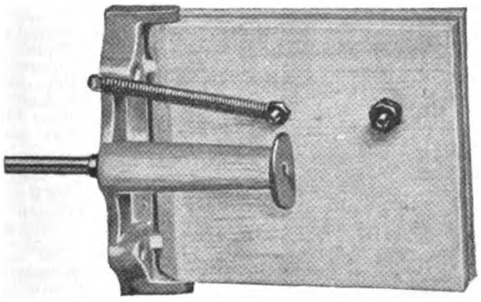

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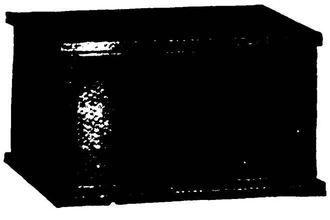
" "B" without knob and dial	1.75
" "B" with knob and dial	2.25
" "B" with knob and dial mounted in mahogany finished cabinet with binding posts	3.00
" "C" without knob and dial	2.25
" "C" with knob and dial	2.75
" "C" with knob and dial mounted in mahogany finished cabinet with binding posts,	3.50
Crosley knobs and dials complete, each	.50

Crosley Cabinets



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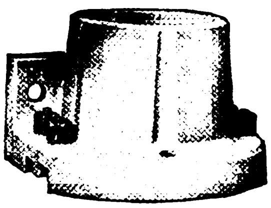

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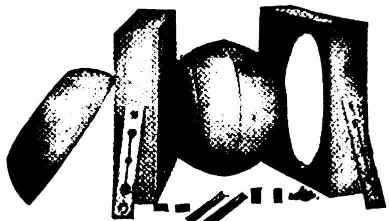
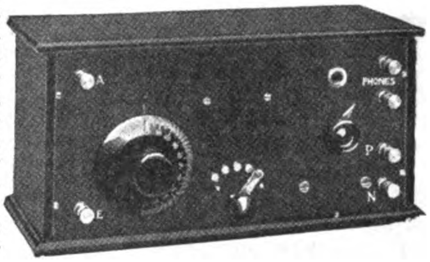


Consist of two stators, one rotor and the necessary hardware as shown in the illustration for complete assembling. Shaft for knob and dial is 3/16" diameter. Wood parts are furnished either in mahogany or poplar.

Price, complete, made of poplar wood $1.50

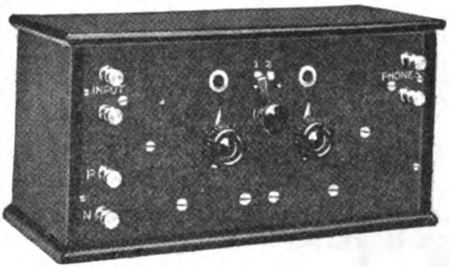
Price, complete, made of mahogany wood $1.75

Harko Senior Radio Receiver



This instrument is a combination tuner and audion detector, and was developed to supply the demand for a low priced efficient receiving outfit with a range of 150 to over 600 meters. The hookup is special—of our own design and is non-regenerative. New Jersey, Pittsburgh, Detroit and other phones are regularly copied in Cincinnati and other points, with this receiver. The HARKO SENIOR is 11½ inches wide, 6 inches high, and 4 ⅞ inches deep. Price, complete without "B" Battery, "A" Battery or phones—$16.00.

Crosley Two-Step Amplifier



This instrument was designed to give the very maximum in value and to match up with the Harko Senior, using the same sized cabinet. Complete with amplifying transformers, sockets, rheostats, switch, binding posts, etc. mounted on formica panel in mahogany finished cabinet. This efficient instrument can also be used with any other apparatus requiring two step amplifier. Price, complete as shown in illustration—$25.00.

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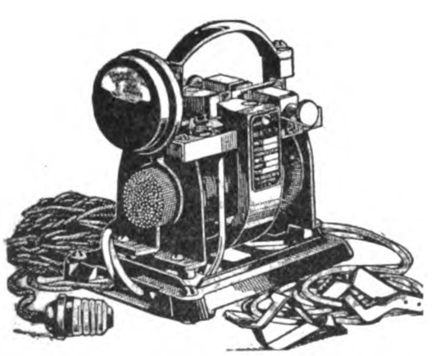

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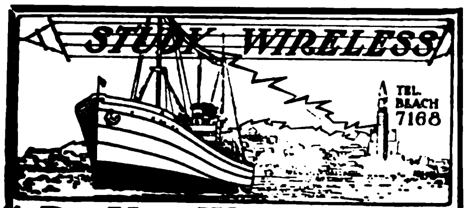

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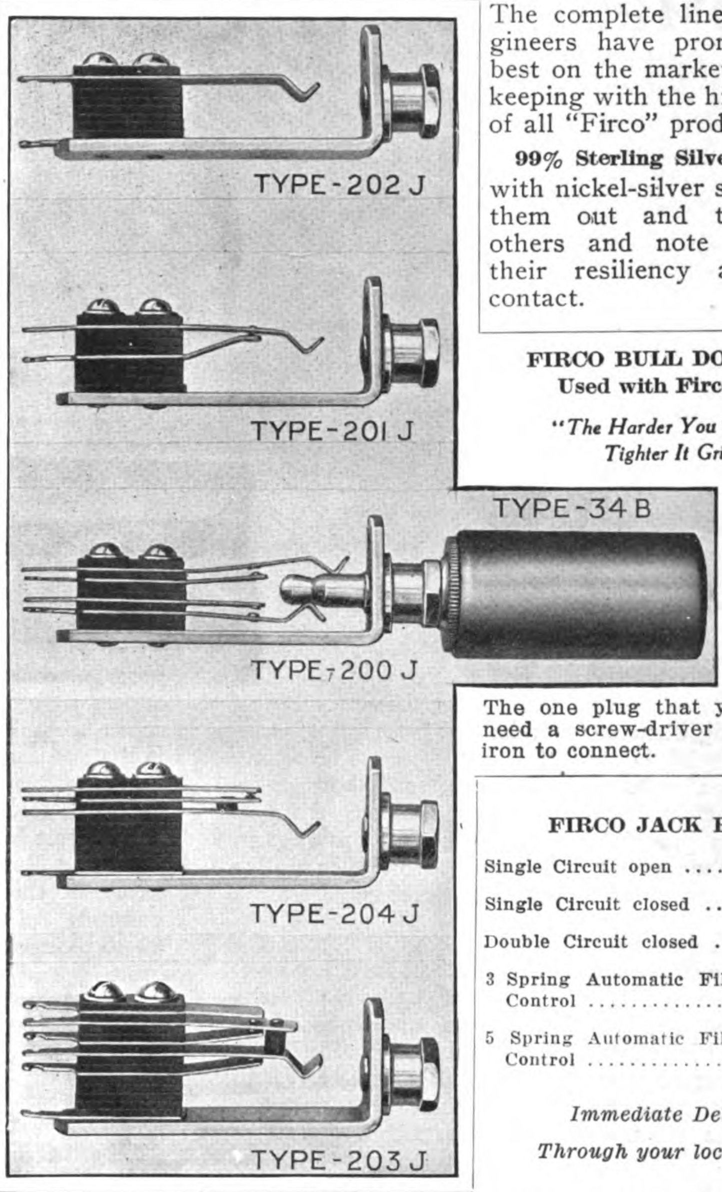

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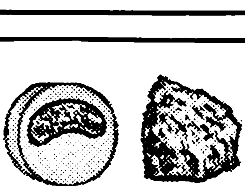

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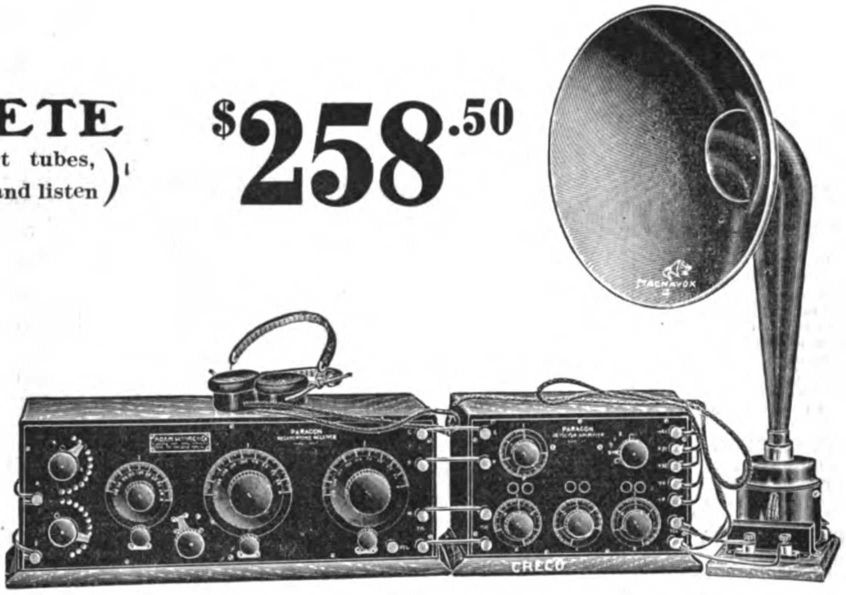

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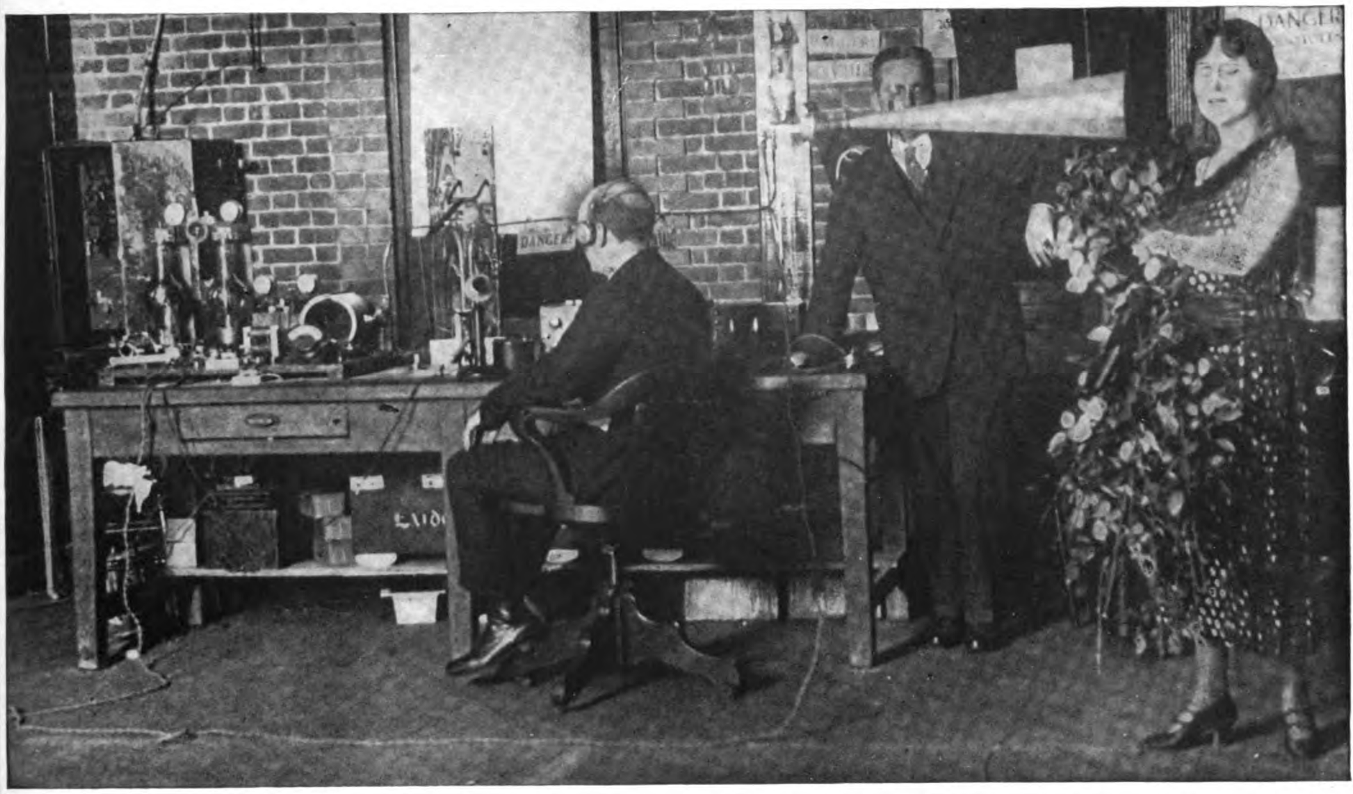

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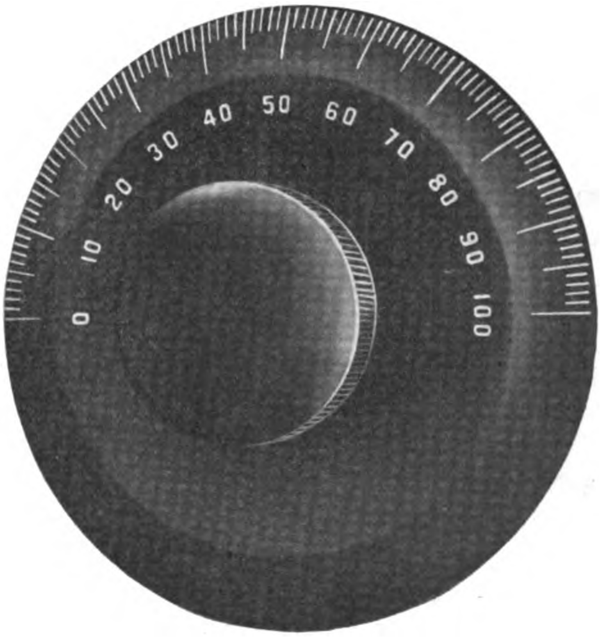

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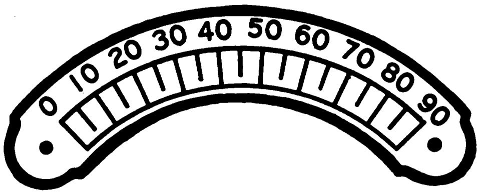

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Crystal Detector Radio Receiver Model E R-753	*$18.00*
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Total for complete equipment	*$25.50*

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Radio Corporation of America

WORLD WIDE WIRELESS

Sales Department, Suite 1801
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Meeting the Demand for Radio Sets

IT is natural that broadcasting, *carrying news, music, lectures, concerts and even grand opera* into the homes of the American people, should have created a concerted and impatient demand for radio sets and apparatus—especially the popular radio receiving sets.

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A new R. C. A. Catalog, covering all the radio devices being manufactured for the Radio Corporation of America, will be ready for distribution within thirty or forty days. This catalog will contain timely and helpful information of great value to the wholesale distributor, the retail dealer, and the user of radio apparatus.

Radio Corporation of America
WORLD WIDE WIRELESS

Sales Department, Suite 1801
233 Broadway, New York City

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THE MAGNAVOX COMPANY
Oakland, California
New York Office: 370 Seventh Avenue, Penn Terminal Bldg.

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2 and 3 stage

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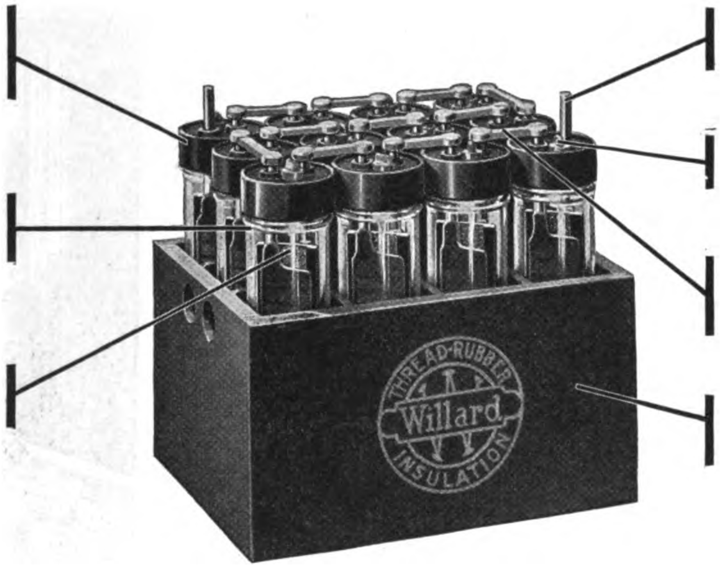

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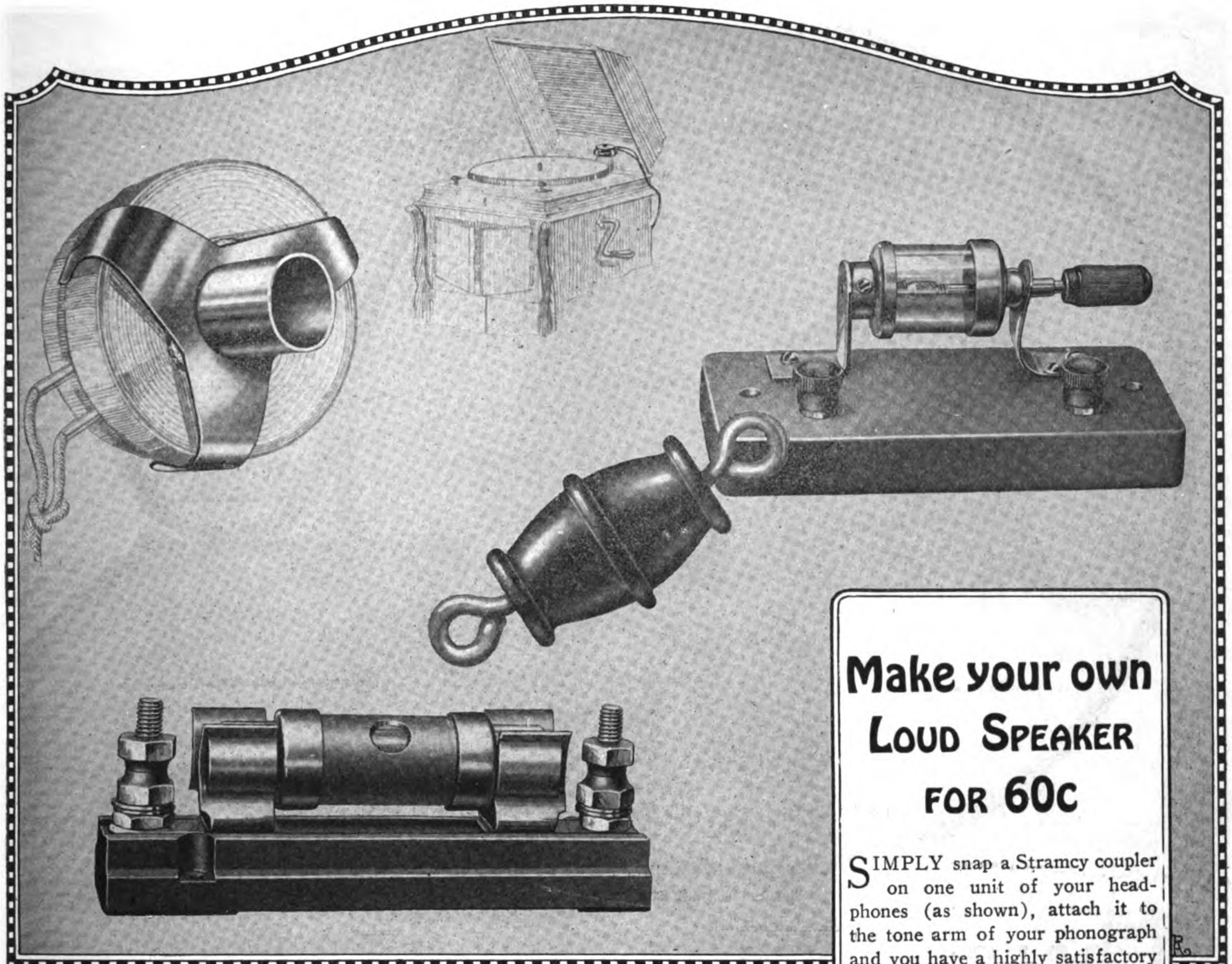

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SIMPLY snap a Stramcy coupler on one unit of your headphones (as shown), attach it to the tone arm of your phonograph and you have a highly satisfactory loud speaker. The sound chamber of a good phonograph reproduces wireless telephone broadcasting with a rich clear tone. Invest 60c and five minutes in this easy way of making a loud talker!

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Protect your home and radio instruments with the

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ABSOLUTE and automatic protection from lightning. No switch to forget. Approved by the National Board of Fire Underwriters, Electrical No. 3962. For the assurance of perfect safety, order a Protec-ton now from your dealer. Remarkable value—**$2.50 complete.**

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KEEP vitality in the battery for your vacuum tube receiving set by using the **Rectigon Battery Charger.**

The Rectigon is a small, inexpensive device that will charge your radio battery over night. It is entirely automatic in operation and needs no attention after it is started.

The Rectigon is portable—it can be placed wherever desired. The absence of oil or grease assures against damage to your floor or rugs.

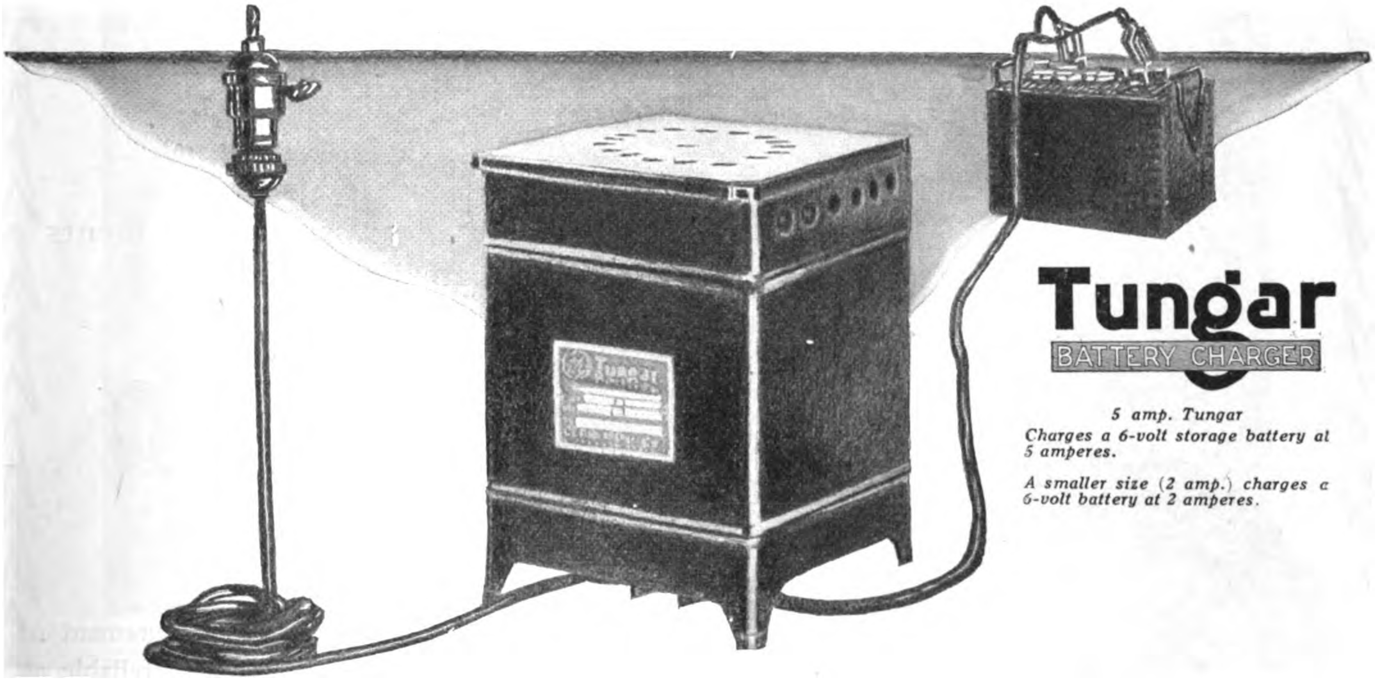
It is as indispensable to your vacuum tube wireless equipment as is the battery, itself.

For details regarding the various sizes of this type of battery charger, write for our Folder F-4491, "Charging the Radio Battery at Home."

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.
Sales Offices in All Principal American Cities

Westinghouse
RECTIGON BATTERY CHARGING

"There's No Place Like Home"
To Charge Your Radio Battery



5 amp. Tungar
Charges a 6-volt storage battery at 5 amperes.

A smaller size (2 amp.) charges a 6-volt battery at 2 amperes.

If you use tubes in your radio receiver you use a storage battery.

If you use a storage battery it must be charged.

Charge Your Storage Battery at Home with a Tungar Battery Charger

Without taking the battery out of the house — in fact, without moving it at all — you can charge it easily and quickly at a minimum of expense, trouble and lost time.

Isn't this much better than taking the battery to a charging station, leaving it a day or two, paying from 75¢ to a couple of dollars and then carrying it back again?

The Tungar is a small, compact rectifier which connects to any a. c. lighting circuit wherever there is a socket or receptacle and requires no attention while operating. Its first cost is not high and it can be operated by anyone without the slightest danger of injuring the battery. Send for new radio booklet and prices.

General Electric Company

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Sales Offices in
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35A-70

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I Can't Depend on My Ammeter!"

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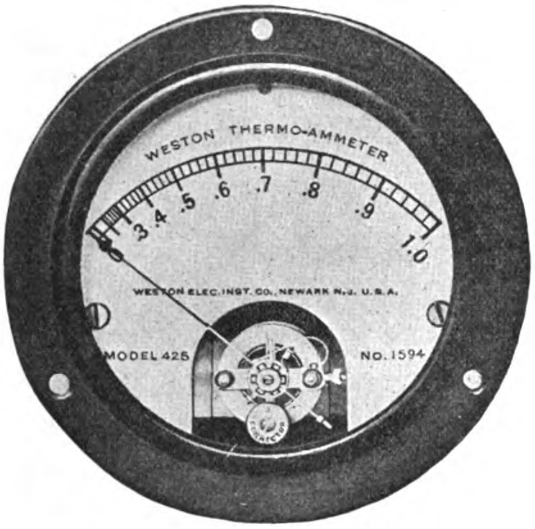
Weston

Thermo-Ammeter



This Instrument has made the measurement of high frequency currents as simple and reliable as any ordinary electrical measurement.

It is free from all the objections and uncertainties of the "hot wire" types.

It is highly accurate and thoroughly compensated against temperature or working errors; it is instantly responsive; it has no zero error or lag, and is designed and built to give permanent satisfaction.

It is a truly scientific Instrument and is the most economical type that can be used in the antenna.

This Instrument is in service in many thousands of Transmitting Sets, including most governmental, commercial and marine outfits, and is now being bought in large quantities by amateurs and experimenters to replace unsatisfactory types.

Complete information concerning this particular Instrument and the *complete group of Weston Radio Instruments* is contained in "Circular J." Write for it. If your dealer cannot supply your needs from stock, we shall be glad to do so.

WESTON ELECTRICAL INSTRUMENT Co., 27 Weston Ave., Newark, N. J.

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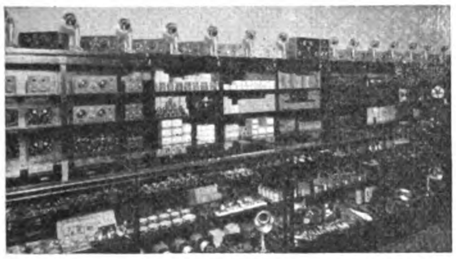
The CAPITAL Serves Indiana, Ohio and Kentucky



Interior of Salesroom

THE Capital Radio Supply Company, located at Indianapolis, was organized by prominent business men for the purpose of supplying this territory with the finest, most dependable and efficient radio equipment made.

Among the prominent manufacturers who are represented by this company are Grebe, Kennedy, Remler, King Am-pli-tone, Hipco Batteries, Western Electric, Signal and Tuska.

Because of the financial strength, the experience and efficiency of the organization and the geographical location, the Capital Radio Supply Company is logically the distributor to *successfully* handle this rich territory.

CAPITAL RADIO SUPPLY COMPANY, Inc.
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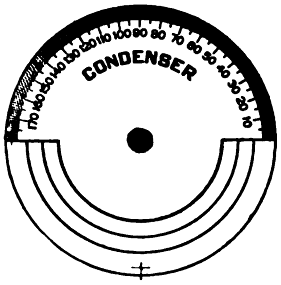
If It's An AETACO You Know It's The Best There Is



Dials

The dials here illustrated are German Silver, made according to Government Specifications. They are especially desirable for those making Regenerative Sets. All models anti-capacity type, illustrated ½ actual size.

Variocoupler Dial	$1.20
Grid Variometer Dial	1.40
Plate Variometer Dial	1.40
Condenser Dial	1.20
Condenser Dial, without knob	.90

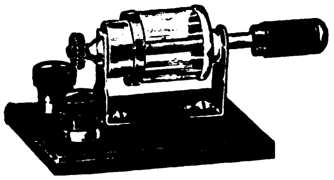
Bakelite

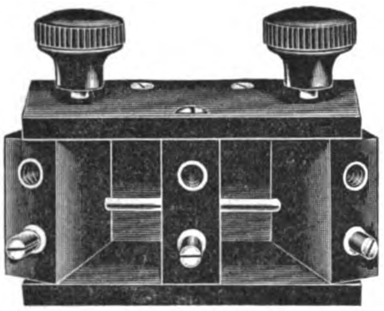
Genuine XX Bakelite and Formica, all sizes and widths, cut to your measurements

Genuine XX Bakelite and Formica, all sizes and widths, cut to your measurements	$2.25 per lb.
Cabinets, 6x6x12	2.50 up

New Model Crystal Detector

AETACO New Model Crystal Detector, mounted on Genuine Bakelite XX base—not moulded. Double rubber tip binding posts. Supplied with super-sensitive, mounted galena crystal. Over-all dimensions of detector 2½"x2"x2". Net weight ¼ lb. Shipping weight ½ lb. Price - - - - - - - - - - **$2.00**





AETACO Inductance Coil Mounting

The AETACO 3 Coil Inductance Coil Mounting is manufactured from Genuine Grade XX Bakelite—not moulded. Consists of three Bakelite standard plugs held in place by Bakelite frame. Plugs are mounted on bearings which makes coupler between coils changeable at will. All metal parts nickel plated. Connecting wire soldered on rear of plugs allows of easy connection. Shipping weight 1 lb. Price - - **$5.00**

Write For Catalog!

AMERICAN ELECTRO TECHNICAL APPLIANCE CO.

227-229-235 Fulton St., New York City

VOLUME 9 *The* WIRELESS AGE NUMBER 8

In Our Opinion

Radio Frequency Amplification

THERE are marked advantages in high, or, radio frequency amplification over the low, or audio frequency method of amplifying in reception. Audio frequency has its place in land wire communication and in the modulation circuits of a radiophone transmitter, but when amplification at the radio receiver is desired it is certainly not good engineering practice to first rectify the incoming high-frequency current and then amplify the rectified current at audio frequency. For one thing, static and other undesirable noises are of audio frequency, and when that form is used in reception they are amplified to the same degree as incoming signals. When radio-frequency is used, static, induction and other disturbances are amplified only slightly, if at all. This one big advantage of high-frequency amplification appears to be sufficient reason for its general adoption.

There is another reason of equal importance, however.

The detector tube of a receiving circuit rectifies, and so makes audible incoming high frequency signals of either continuous or discontinuous waves. On weak signals, however, the tube will function only to a certain point. Where signals are too weak to be detected and rectified by the detector tube, they are lost, and no amount of audio frequency amplification will help matters. The proper thing to do, therefore, where reason or desire exists to warrant it, is to amplify the radio frequency of incoming signals, then detect it, and again amplify the resultant audio frequency.

A number of textbooks contain diagrams of radio frequency amplification circuits, but while all of these will operate satisfactorily on frequencies from 500,000 down (or wavelengths 600 meters and up), there has been only one circuit up to the present time which will operate efficiently on frequencies in the neighborhood of 1,500,000 (200 meters), that being the resistance-coupled super-heterodyne circuit developed by Armstrong and used by Godley at Ardrossan. This super-heterodyne circuit, while affording marvellous amplification, calls for the use of so many tubes that its use is practically prohibitive to the average amateur.

In the super-heterodyne arrangement used by Godley (which, by the way, was not unduly elaborate), nine tubes were used for spark signals, and an additional external heterodyne, ten in all, for C.W. reception. This number of tubes is required because a considerable proportion of the incoming energy is lost in the transfer coils which this type of circuit makes necessary between the high and intermediate circuits and again between the intermediate and low, or, audio-frequency circuit. Roughly, this arrangement, while extremely sensitive and reliable, is beyond the average amateur, for, in addition to first outlay for assembly and installation, there is an exceedingly heavy drain on the facilities for filament heating, the average current for the number of tubes used by Godley being 10 amperes.

The new iron-core transformers which are now available to the market have undoubtedly solved the problem of amplification at high frequencies, having been designed to work on a broad band of frequencies, without tuning, at which most amateur operation is carried on and also over a wide band of lower frequencies. The circuits are similar to those used for audio frequency amplification.

△ △ △

Protection Against Lightning

COMMON sense, and the Fire Underwriters, both dictate that with the coming of summer every operator of a transmitting or receiving radio station employing an outdoor antenna should provide some approved form of protection from lightning. An antenna is no more of a menace during an electrical storm than a telephone wire, an electric light wire, or even the wiring of doorbells and other interior communicating systems. Yet the menace exists and the possibility of damage should be reduced to a minimum.

There are several ways of protecting a building, the antenna lead-in may be disconnected and the end dropped to the ground, outside. But this is not a good method unless each time the antenna is disconnected the lead is clamped to a ground pipe in order to provide a path of low resistance. When the antenna lead is merely thrown on the ground, a high resistance exists between the antenna and ground, which is liable to cause a lightning discharge to jump from the antenna to other nearby objects which offer a path to ground of lower resistance.

Two devices for lightning protection have the approval of the National Electric Code—the manually operated switch and the grounded short gap.

With the manually operated lightning switch thrown to the grounded position, heavy electrical surges induced in the antenna system by nearby lightning discharges pass swiftly to ground.

The grounded short gap operates automatically. It consists of two electrodes held in a fixed position in a sealed chamber from which the air has been exhausted, and it has been found that inductive currents readily pass through the gap in the thin air in the chamber.

But whatever the device, a good ground connection should be provided. Two or three lengths of galvanized pipe driven at least four feet into the ground is a good arrangement; also metal plates buried in the ground, two or three feet below the surface; or, the connection may be made to a water pipe. The conductor running from the lightning protective device to ground should be not smaller than a No. 4 copper wire, copper tubing ¼ inch outside diameter, or copper ribbon ⅜ inch wide. The conductor must be mounted on insulators and must be at least 5 feet clear of the building. All connections should be soldered.

There are very few cases on record of lightning having actually caused any damage to radio stations. The chances are no greater than for any other building. The impressive total of 600,000 radio installations in American homes at the present time at least calls for a word to the effect that a well-grounded antenna is not only itself protection again the effects of lightning, but is also a protection to the building on which it is installed.

THE EDITOR.

Meet the Opera Star Who Calls Radio "Weird"

SPEAKING for the first time in an interview directed especially toward radio listeners, Marie Sundelius, for six years a star in the Metropolitan Opera Company, declares the future of radio will reveal a heavy demand for the very best in music. Read her interesting prophecy on page 29

Listeners Want to See Her, Says Dainty Singer

RADIO does not raid the theatrical box office according to Vivienne Segal, charming musical comedy artist, shown here. This winsome songbird, unable to meet her appreciative radio audience, was glad to express her frank views for them, and this she does in an interview which appears on page 31

Prima Donna Introduces Radio to the Stage

OLGA STECK, petite and beautiful star of the new musical comedy "Sue, Dear" is billed as "A Girl You're Sure to Love," which seems specially applicable to radio fans to whom she expresses gratitude for their letters of appreciation, in an interview on page 35

Know This Friend of Phonograph and Radio?

LAUGHTER—that's Billy Jones' creed. Billy, seen above with his characteristic smile, made 'em laugh from WJZ. And the reason for his success is given in the interview on page 39. Jones has no peer on the phonograph or on the air as a humorous entertainer and a singer of popular songs

Radio Appeals Alike to Beauty and the Beast

From her room in a New York hotel, Ethel Hart endeavors to hear Brookline, Mass., where someone near and dear is trying to get a message "across"

And radio brings joy to Jiggs and Maggie of comic page fame. At last a way has been found to make Jiggs stay home

Even the beast listens. "Jocko da monk" has learned something new, and like the rest of "Darwin's descendants", he's a radio fan. It is not wholly clear whether Jocko is listening to a Russian ballad in the original, or to some choice bit of jazz, but whatever it is, his quizzical expression doesn't disclose his opinion of radio as a counter-irritant to monkey itches

Official Washington Lends Eager Ear to Radio

Latest of the diplomats from overseas to install a set is H. H. Bryn, Norwegian minister in Washington

American officials, however, were first to install sets in their offices. The photo shows that of Edwin Denby, Secretary of the Navy

Not content with a set in his home, Secretary of State Hughes had this one placed in his office in the State Department

General John J. Pershing, Commander of the American Army, fell an easy victim to radio telephone broadcasting, for he can combine pleasure with duty in following closely the development of air communication, so vital to mobile forces in time of war

And so did Herbert Hoover, Secretary of Commerce. He should make a good job of governmental regulation, for he is a genuine radio fan and is getting first hand knowledge of the problems associated with the limitation of wave length bands and possible resultant confusion

Radio Penetrates Even Behind the Calcium Lights

In the movie studio Gloria Swanson finds time to listen in between the "shooting" of scenes

And in her dressing room between acts Jane Richardson, star of "Just Because," hears broadcasted programs

Everyone knows the Dolly Sisters. They are seen here at a Brooklyn theatre where the famous dancing pair listened in and caught the popular fever

In All the Realm of Childhood Radio Is King

Because he is only four, the young son of Walter Garvey of Fordham, N. Y., tries to send on a receiver

The modern child finds no terrors in the bath. Thomas and George Mahlia of Brooklyn enjoy themselves in a manner which is self-explanatory

Little Dorothy Hasselbrook's Daddy ran out of bedtime stories just about the time radio became popular—then the problem was solved to Dorothy's complete satisfaction

A radio set will help pass the time when the fish aren't biting says Jimmy Dunn—a young convert to radio

The Permanency of Broadcasting

How A Scientific Novelty Developed In Eighteen Months to a Necessary and Popular Service—Present Limitations and the Line of Future Extension

By H. P. Davis

IT is always unsafe to assume the role of a prophet, but the writer presumed to take such a chance more than a year ago when in a published article he made the following statements:

> "The adaptability of the radiophone, to broadcasting reports, news, entertainments, concerts, lectures, etc., creates a field particularly its own, and it is reasonably certain that the future will see many changes in the present accepted methods of conducting such functions and entertainments. It is quite possible that especially constructed transmitting rooms will be provided for such purposes, so that voices and music will be broadcasted through unbounded areas and listened to by invisible and widely distributed audiences of vast numbers. The same opportunities would thus exist for the country dweller as for the city resident, and inmates of hospitals and sanitariums, and sick people and invalids in the home would have opportunities for pleasures and diversions now denied them. A transmitting system of this character would have the further great advantage of doing away with the necessity of appearing in person in public halls and auditoriums, the capacities of which at best are quite limited.
>
> "The importance of reaching such tremendous numbers of people, with practically no effort, offers great possibilities for advertising and the distribution of news and important facts, and in reality introduces a 'universal speaking service.' It is not unreasonable to predict that the time will come when almost every home will include in its furnishing some sort of loud-speaking radio receiving instrument, which can be put into operation at will, permitting the householder to be in more or less constant touch with the outside world through these broadcasting agencies.
>
> "The field of radio application is practically unlimited in the important affairs of the world, and this development will mark one of the great steps in the progress and evolution of mankind."

What is the situation today? In a period of wide-spread business depression, and thus a most inauspicious one for a new venture, radio is a topic of as universal interest as the weather; and the spell of radio broadcasting especially is becoming world-wide.

It is probably a fact that no facility or service has ever received such instant response from the public or has grown so fast in popularity, and at a time when the public buying power was generally believed to be nil, a market has been developed which is limited only by the ability of manufacturers to supply apparatus.

H. P. Davis, Vice-President of the Westinghouse Electric and Manufacturing Company

Civilization progresses in direct ratio to the advance in communication and transportation facilities, and the public is quick to recognize and seize upon, and make use of, any new developments in either of these services. In a sense, radio broadcasting as a service has opened a new field for public communication, and what has been more or less of a scientific novelty, or possibly a visionary dream, has become almost overnight an accomplished fact and a wide-spread and necessary popular service.

It is fascinating in its mystery, and this is undoubtedly one of the greatest attractions in its first appeal to the imagination. But it is destined to be something more than a fascinating novelty, for as the possibilities of radio unfold we see before us a wonderful and permanent public service comparable with other modern facilities and conveniences in its ability to make life easier and better. Radio annihilates distance, reducing it to nothing, since the element of time scarcely enters into the speed of the transmission and can be entirely disregarded when it is possible to encircle the globe in a small fraction of a second with a radio wave.

We all realize that the interest of the public is fickle and that the mystery of this wonderful agency will wear off as it ceases to be a novelty, but even admitting that, the element of permanency is present in radio broadcasting. This is evidenced by the thousands of letters that have been received from the radio audiences, of which the following are samples:

> "I'm an old lady, almost blind, 75 years old. My youngest grandson, an 18-year-old senior in high school, installed one of your radio sets for me last Monday, March 20, and I have enjoyed three fine concerts and two noon-hour services at Trinity Church. You are doing much good and giving great pleasure to the many, many 'shut-ins' like myself."

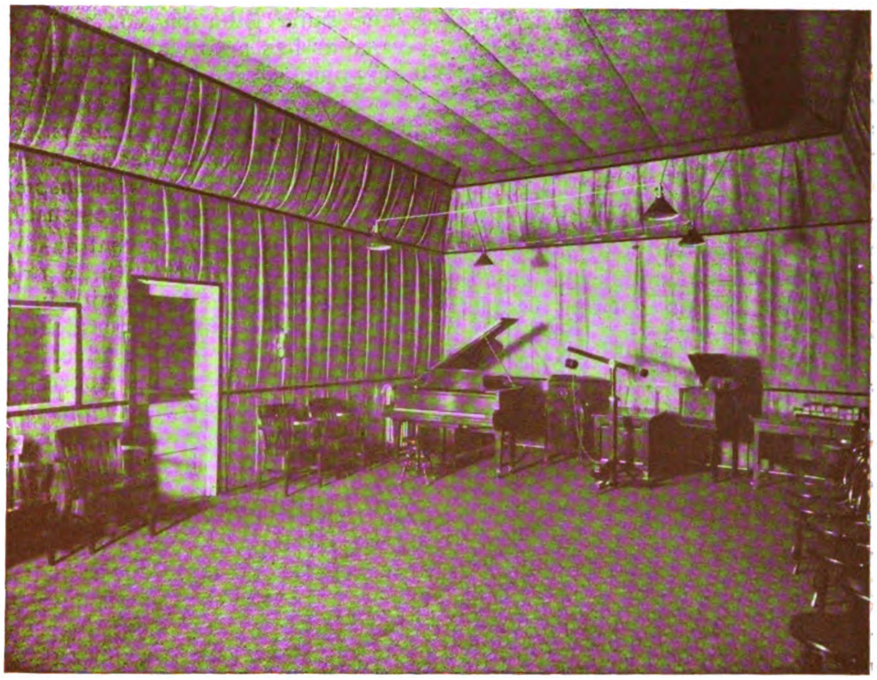
> "We are located up on the lonesome mountains of Southeastern Kentucky. We listened in on your program last evening, and we certainly appreciate this very excellent music. We are about 200 miles from any large city, so you will understand why this is such a great treat to us and our miners."

> "We enjoyed every bit of Tuesday night's program, but especially the talk given by the 'Bird Man.' We are country people and you know we live very near to nature, so his talk of the birds was very interesting to us. We are thankful to have lived to see this possible and we are surely indebted to you people who make it so. Being elderly people and during the winter's bad weather not often able to get out, it is a very great thing for us to be able to enjoy such things by radio."

Half our population resides in the country, and conditions similar to those recited in these letters will prevail. But consider also what it means to the sick, the infirm and the aged, even though they may be residents of the cities.

The broadcasting of church services alone, which was initiated by KDKA, the Westinghouse Electric and Manufacturing Company's broadcasting station at East Pittsburgh, Pennsylvania, would in itself be sufficient to make radio broadcasting permanent and invaluable. This service met with instant response, for it was at once unique and compelling it its appeal to people of all ages, classes and denominations, and is proving to be one of the greatest publicity and beneficent features ever presented; it is doing more to enlarge the church's sphere of influence than any medium heretofore utilized.

As radio broadcasting is developed today it has one feature not possessed by any other service in existence, and except for the comparatively small cost of the initial installation, it is without favor and without price. Everyone can occupy a "free reserved seat" at any and every radio broadcasting performance. This is an important fact not generally recognized, for while one large electrical manufacturing company initiated the service and several companies are now maintaining broadcasting stations, the only financial support they receive for this costly service is the possible profit from the sale of receiving apparatus of their manufacture; but there are hundreds of other manufacturers and dealers who are manufacturing and selling receiving apparatus also, who do not support this service in any way whatever and who, because of this service, reap large benefits without exertion or expense on their part.



The specially constructed studio at KDKA station which realizes the prophecy of a year ago that such rooms would be provided for broadcasting stations

It is doubtful if there is any way in which this service can be made a direct revenue producer for such companies or institutions as foster it. Recognizing this fact, there must then be developed sufficient indirect value to those maintaining radio broadcasting stations to make it profitable for them to operate and develop this service.

To the uninitiated it probably seems a simple matter to install a radio transmitting outfit and to broadcast music and speech and thus call the installation a broadcasting station. KDKA has now been in operation since the early part of November, 1920, and as the pioneer in radio broadcasting service, has made history in the development of the radio broadcasting art. It will be difficult for anyone now sitting at a receiving instrument to realize the amount of development work and expense that has been attached to bringing that station to its present effectiveness, but I am quite sure that if it were possible to compare what was considered good broadcasting a year and a half ago, and what is being transmitted today, it would at once be evident that a wonderful improvement has been brought about.

When W. J. Bryan speaks nowadays over the radio a quarter-million people hear the great Commoner

The transmitting microphone at WJZ into which great artists sing represents months of laboratory research and operating development

There are still considerable limitations in the ability of the available broadcasting apparatus to transmit talk and music tones true to life, and ultimate perfection of trueness is only attained when the listener receives what is broadcasted in the natural reflection and without distortion. Much thought is being given and work done to reach this perfection, and it is the writer's belief that very material steps of advance in this will be forthcoming shortly.

Our apparatus and means for radio broadcasting are today undeveloped, and if greater perfection is to be attained, confusion, with resultant public disgust, must be prevented; so protection of some kind is due those who foster and develop this service.

Recognizing that inefficient and interfering service will not be tolerated, the Government has already taken preliminary steps to formulate regulations with a view to materially improving this situation, in the recent conference held in Washington under the auspices of the Department of Commerce. As the conditions of service and the requirements of the public become better appreciated, means will be found to attain this end.

There are comparatively few available wave lengths in the ether, and to encourage this very necessary development these ether wave bands must be allocated and administered with much discrimination and care. Only companies or institutions with competent research and operating staffs, and financial means to back them, can possibly support this service in a proper manner and accomplish this most desirable perfecting of radio broadcasting. In other words, radio broadcasting is an infant industry and it must have protection, and if this is properly and conservatively done we shall hold the public support and shall look back in a very short time in amazement at what has been accomplished.

It is unfortunate, however, that this imperfection of the sending apparatus is not as fully realized as it should be, with the result that many new broadcasting stations are being planned which must necessarily give only mediocre results. Not only is the ether going to be crowded, but crowded with discordant and disagreeable performances.

I feel that this period is going to be the test of the public's approbation. The growth of the public approval has been too rapid to be healthy, as it outstrips the growth of the development of the art, and while the fascination of broadcasting is the impelling force now, the period of development of not only the apparatus, but of the service itself is going to require patience and forbearance on the part of the public.

The same situation confronts this service as has been encountered in all other innovations or great steps of progress, and that is the attitude of those in allied established activities to look upon the newcomer as a rival which is to be regarded with suspicion and gauged in a competitive sense.

It is easy to see from what has been said herein that there is little or no revenue-producing opportunity in this service, and that the value attached to it is almost wholly one of advertising. Until this is realized and appreciated by those who must furnish the talent for the program, however, more or less difficulty will be experienced in perfecting and broadening the program service, and the attitude now being met on the part of a few lecturers, artists, theatrical and concert managers who refuse their assistance for fear of adversely affecting their box-office receipts and of reducing their earning capacity, must be converted to an appreciation of its advertising value — not as a destructive, but as a constructive agent: for if advertising in any way has been a benefit in helping the growth of such undertakings, the far greater advertising possibilities in radio broadcasting must undoubtedly bring greater returns for the amount of energy expended than any other agent yet available.

Undoubtedly, however, if this service is to fulfill its mission, ways will be devised to overcome this difficulty; for in this case as in other cases of unusual developments, it will eventually be found that, instead of being a competitor, radio broadcasting becomes a source of development and extension to the other arts. A service which offers such possibilities must in the future wield a tremendous influence, and overcome obstacles which now beset its path.

In broadcasting, radio has found its greatest usefulness and its most important field of application, and it is destined to become a basic public service. The road is a rough one, however, as many of us who have been intimately connected with its development are realizing.

Radio and the Phonograph Dealer

Abstracts of an Editorial From "The Talking Machine Journal," Showing How Radio Will Help the Phonograph Business

THE big new idea in the talking machine field is Radio-Telephony. Like all big new ideas it is fraught with blessings or — blow-ups. When we contemplate the fact that in a time when all other businesses were moving with extreme slowness, or were actually at a standstill, radio-telephony sprouted up to a towering height in just a few months, we must admit that it has great force in it. But on the other hand, has it real strength and staying power? Granted that it has stability and a future, what does it mean to the talking machine dealer, and how should he connect himself with it? How should he plan today?

In considering radio and its possibilities, merchants should bear one thing steadily in mind—that they are in the phonograph business. The phonograph business is firmly established as a part of the commercial structure of this country. The recent census department report gives figures showing that only the automobile business rivals the phonograph business in the volume of sales — with two and a quarter million machines made and marketed in 1919 — and over two-thirds that number produced last year, admittedly an off year. Hence it becomes a question of the old and established business brother holding out a helping hand to the newly arrived child of commerce.

The point of view should be that the dealer should interest himself in the possibilities of radio because it can help his phonograph business, and, viewed from the other side, because he is the one merchant who is today properly equipped in his store and his business experience to distribute this type of goods and more particularly the type of goods that is being rapidly developed, namely the cabinet installed sets, particularly those combining phonograph and radio equipment.

At present there seems no chance for competition between broadcasted radio music, and the fine reproductions of artists to be had on the records. A fraction of the family's "listening time" may be absorbed by the radio outfit, but in general what they hear will stimulate a desire to own a smooth and artistic reproduction of the selection that they can put on their phonograph and hear through without interruption at any time they wish. This is without prejudice to the fact that radio contributes many individual and interesting features of its own to the home entertainment. Phonograph dealers should take hold of radio both for its present and for its future, going ahead conservatively and making sure that they have allied themselves with only standard and reliable lines. Plunging in the ordering of goods is not justified. The point is not so much to get goods as to get the proper kind. A few bad outfits will damage the entire proposition in your neighborhood. Radio is here to stay, and the dealer who proceeds cautiously with it, from the point of view of developing his phonograph business, will make more and better sales than the one who rushes in without proper consideration of the pitfalls as well as the profits.

Scene: Movie house in Kokomo.
Time: Nineteen twenty something.
Idea: Movie houses have installed radio. Three thousand get their music from Chicago orchestra.

We see the villain approaching the country lassie. Evil is written all over his face. The girl is frightened. He grabs her. They struggle furiously. Just as the fight is at its height, something slips in the music synchronizer and there bursts inappropriately forth from the radio receiver:

"Dapper Dan, der Pullman Porter
man,
On a train that ran through Dixie."

Marie Sundelius Says:

"Radio is Helping to Make Musical America More Musical"

Metropolitan Opera Singer Tells Paul S. Gautier in an Interview That Radio Never Can Supplant Opera Because Opera Not Only Includes Song, But Action as Well. But Arias, She Adds, and Other Good Music, Will Be In Heavy Demand by Those Who Listen In

SEVERAL times from WJZ radio-fans have heard Marie Sundelius, the Metropolitan Opera Company soprano, via the radio telephone. And they still are talking about the charm of those hours of entertainment.

It may be confusing to use the word entertainment in connection with her concerts over the radiophone, for that designation is so liable of interpretation by a hasty public as amusement of a less substantial or popular nature.

When Marie Sundelius sang, her selections were from operas, and a grateful, listening world thanked her for it. There is ample evidence to prove it — the hundreds of letters that come from the unseen audience to an artist it appreciates.

She showed me some of the letters when I went to see her in her apartment just off Central Park West, in the Nineties, in New York City. I wanted to be the ambassador of these thousands who "listened in," and to be able to visualize for them by picture and word as best I could, the star soprano they came to know in the brief space of an hour or so.

It takes but five minutes, by any correctly functioning watch, to feel that you have known Marie Sundelius for a long time. She puts you at complete ease, and when she makes a statement, or answers a question, she seems to put a reserve of vitality into it. When she smiles — well, it is a smile, one of the kind that would thrown light back into any shadow. Which is one way of saying that your first and lasting impression of the diva is one of a personality that fairly scintillates.

Country Not Unmusical

Marie Sundelius has an introspective turn of mind; and convictions; she knows the American people want good music.

"This country is not unmusical," she told me, "it is not really, as so many have said in the past, a country that likes only the popular songs.

"I have found that people will take the good things in music more eagerly than the other kind, if you will only give it to them. One summer I went to a boys' camp to sing. I was warned by good-intentioned friends, not to sing classical or operatic selections. They told me to sing the popular songs; the boys wouldn't understand any other kind; and they would not listen to the classics. I am glad to say I did not take their advice, and that the boys took to the operatic music like the proverbial duck takes to water."

Marie Sundelius as Ah-Yo in "L'Oracalo"

It was at this juncture I mentioned that I wanted to know on behalf of my constituents—the radiophone listeners—whether a complete opera lends itself to the radio; more specifically, whether the difficulties of trying to broadcast an entire opera gave commensurate satisfaction.

"It is quite impossible to literally broadcast an entire opera and give satisfaction to the patrons of this class of entertainment," she answered, "because opera means not only song, but action.

"It is as easy, of course, to sing a selection from any opera over the radiophone as it is to sing any popular selection. But it is the sight in opera that counts heavily, being able to see the performers, their costumes, the wonderful scenery, and the action of the theme. You cannot project that over radio.

"But as far as being able to send good music over radio, that you can do, and that will be done more and more, for there is, and there will be to a greater degree, a demand for good music. Such a wonderful invention as the radiophone will help tremendously to make this good result possible. It is all helping to make musical America more musical."

The opera and concert star received letters from not only those who have seen her in a performance, but those who haven't, and who admit they had never taken much interest in opera until they heard her "on the air."

She laughed heartily when she told me about a friend, Dr. Joseph A. McPhillips, who lives in the same apartment building. They have been neighbors for about two years, but never once had the doctor heard her sing until the first night she broadcasted from Newark; then he heard her via the radiophone. She smiled at the thought of going miles away from home to have her neighbor hear her voice for the first time in the very building where she lived.

"Positively Weird"

"It is a wonderful invention," she said, "in fact, I think it is positively weird."

Marie Sundelius has been a Metropolitan Opera Co. star for six years. Before and after seasons she appears in concerts, throughout the country.

She told me an interesting thing. It seems she, born abroad, received all of her education in this country, most of it in Boston, which really is her "home town." It was in New England that she was a singer in her church choir, the same church in which were hung the two lanterns to notify Paul Revere that the British were advancing by land. This took place in the old church building, but though she sang in a newer church, it was before sociologically the "same" congregation as that of the famous Revolutionary Days, for her auditors were the grandchildren and great-grandchildren of those who attended it when this country was in the making.

Before I left she emphasized again, and she asked me to tell the listeners in words as emphatic as I could summon, that she knows that they want the best of music, and that she is confident that radio will do its share to implant this desire even stronger than it is now.

"Hello, Pa, I'm Half-Way To Europe"

THE shore-to-ship tests recently carried on between the America, bound for Europe and a station on the Jersey Coast, have proven so successful that it is probable many ships will carry on radiophone communications as a feature of their service.

Soon after its departure from New York, the America exchanged conversations with the Jersey station. This was continued several times a day during the long voyage. An operator especially assigned to the America noted the degree of clearness with which the messages were received during the trip and reported that news digests, music, and other messages, were received with fine distinctness.

A ship recently arriving from a South American port, while off Cuba, picked up New York, Pittsburgh, and Chicago broadcast. Trans-Atlantic passengers may soon be able to exchange greetings with relatives on shore two or three days prior to their landing.

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Political Opportunities

WHEN the next national nominating conventions for the Presidency come around again in June, 1924, a majority of the electorate will be in the gallery during the proceedings.

All the excitement, the partisanship, the tensity, as ballot after ballot is taken without result as candidates rise to greatness and fall to oblivion within an hour, will be transmitted to the American people by radio as directly as if they were in the great convention hall itself. The reaction on our political methods and manners is certain to be drastic, although the definite results are hard to predict. Certainly they cannot be for the worse.

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Radio's Relation to Theatre

THE radiophone, its relation to the theatre, what it is destined to become in the future, and numerous other angles form a topic of conversation at present in almost every gathering of theatremen. Everyone seems greatly interested. Virtually every day the radiophone is coming into use in connection with this or that—which keeps interest at high pitch.

How can the motion picture theatre owners best make use of this latest invention of science. This is the question in which showmen are primarily interested. And here is a suggestion from H. G. Stettmund of the Odeon theatre, Chandler, Okla., that furnishes food for considerable thought on the subject.

In a letter to Martin J. Quigley, publisher and editor of the Exhibitors' Herald, Mr. Stettmund writes:

"The radiophone is working wonders and it is practically in its infancy. I have written to several theatres who have installed receiving sets with loud speakers and they claim it has increased their attendance greatly.

"Would it not be a good idea to have one of the leading theatres in New York City, Chicago, Kansas City, Dallas, Denver, etc., to broadcast their music every day.

"The hundreds of small theatres in each territory could put in receiving sets and use this music in their own shows. Of course, there are a number of theatres that have their own music and play to their pictures, but there are hundreds using mechanical music.

"Let each exhibitor using this service pay $5.00 or $10.00 per month for this privilege. In this way the broadcasting theatre would soon get paid for their installation and a nice revenue each month. The payment by exhibitors would have to be on the honor system. There are possibly some who would use the service and not pay, but thank goodness they are greatly in the minority.

"The theatre using this service would soon have sufficient additional patronage to pay for their installation and derive a good revenue also.

"I hope the National Convention will take up this matter and see that something regarding this is done."

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Music by radio gives Agnes Ayres and Milton Sills an opportunity to dance between sets in the Paramount Studios in California

Room and Bath with Radio Now

AS soon as the radio wave of popularity spread the first ones to recognize its commercial value as a medium of getting publicity were the hotels and cafes. Many New York cafes, prominent ones, too, have installed radiophones in their dining rooms besides the regular orchestra, and when no music is coming over the ether, the orchestra plays. Dances are held in such places by radio music, and as the country editor would say, a good time is had by all.

Several of the big hotels have been approached by dealers in radio equipment with a proposition to equip the hostelry rooms with radio receiving sets. The hotel men are hesitating. They want to—but—it would require more help, more watching of the rooms to see that the equipment is not purloined, and they question whether the value of the radiophone in the room would more than offset the difficulties which would naturally arise. They haven't said no, and so maybe our hotel room of the future will have not only a bureau, bed, and bath, but a radiophone as well. Oh, for the life of a traveling salesman!

"Singing over the radio telephone certainly does not hurt the box office value of the performer," said the demure little Miss who is more thoughtful than her mischievous posture indicates

An Interview With

Vivienne Segal

By T. J. Dunham

Vivienne Segal is a home loving girl

"BUT it is the romantic side, just the very idea of being able to do it all, that really attracts me to it!"

If you are a regular at the theater you will recall—very pleasantly—the beautiful young woman out of whose bow-shaped lips the above words slipped.

She is Vivienne Segal, one of those fortunate, young, talented and earnest women — I should say girls — who are just commencing to peek over the hill and down into the valley into which shines a golden sun of success, flooding the sloping hills and the little homes with peace, happiness, and contentment.

And it should be mentioned the figure of speech is reflected in her. We were chatting in the quiet of her New York apartment.

What I wanted to get was an expression from one in a position to know as to whether or not singing over the radiophone hurt the box office value of a performer.

And I could think of no one better qualified to answer. Here was a girl who was gradually gaining a name on the stage, who has held important roles in musical comedies such as "Oh, Lady Lady," "Blue Paradise," "Miss 1917," "The Little Whopper," and others.

In one show she has been starred—the last one in which she played before she entered big-time vaudeville, where she will show until this Fall before again entering musical comedy. She admits frankly that the first — and thus far the only — time when her name appeared in electric lights in connection with a regular production, she stood gazing fondly at it, oblivious of the passing Broadway throng. I mention this to show how frank she is in saying what she means.

If radiophone singing were going to hurt anyone at the box office it would be one in such a stage of development as Miss Segal. She has not yet arrived at the Julia Sanderson degree of public popularity. But she is headed that way — and her radiophone work is proving one of the vehicles to speed the journey.

"It's the romance that get's me," she was saying.

"Think of sending your voice so that those hundreds of miles away will hear it as quickly as those in the same room. When I was asked to first broadcast I was delighted with the idea. It was distinctly novel for me."

She reviewed her career, which, though while she is still very young, has extended over slightly more than six years. And in all her work, she says, none received such wide "publicity" — don't confuse it with "popularity," — as her radiophone work.

That allowed me to bring up the subject I was interested in.

"Singing over the radiophone certainly does not hurt the box office value of the performer," she said emphatically. And she gave a decided emphasis to her statement with a very positive shake of her golden hair.

It's bobbed—that hair—and forms a pleasing background for a peach complexion, intelligent eyes, and expressive mouth. (Remember that when next you hear her over the ether waves.)

"As a matter of fact," she continued, "it does the opposite. It increases an artist's value to the box office. Those who listen to her want to see what she looks like, and when she appears in the local theater they go and feel a sort of personal, friendly interest in her which they would not otherwise feel.

" 'Oh,' they say, 'I heard her over the radiophone. I didn't know she looked like that.' That was the tone of a big majority of the letters I received. They said they wanted to see me, and would not lose the opportunity if I played a nearby theatre.

"That would seem like conclusive evidence. But it isn't all. Everyone is entitled to his or her opinion. But it seems to me that this idea that radiophone work will cut attendance at the theatre, likens very much to the time when phonographs were introduced. Everybody says this, and in my opinion they are right. Many theatrical men thought if a performer sang for the records the people who bought the records would not want to pay good money to hear the performer in a theatre. The opposite proved true. And the movies. There is always a place on the legitimate stage for a movie star, providing, of course, she has stage presence for the spoken drama."

ON one occasion when Miss Segal sang from Roselle Park station she discovered she was without an adequate supply of songs. In the emergency, selections she had never practiced were given her; she sang them at sight, demonstrating she not only is a talented girl, but is quick to overcome unforeseen handicaps of a kind those who listen in never hear about

London Amateurs Busy

LONDON is awakening to the pleasures of the radio telephone. That London should only recently have heard its first radio concert, and that special permission should have been necessary to stage it, shows how far behind England is in the radio game as compared with the United States. England, however, is beginning to realize that not only the United States, but also Continental countries, are leaving her with a lot of leeway to make up in wireless matters. Holland, for example, the scene of Florence Parbury's experiments in transmission, is now broadcasting news daily and has a local news service in which Stock Exchange quotations figure.

An agitation is being set on foot here against the "pettifogging restrictions" which, it is charged in radio circles, are responsible for hampering the amateur pursuit of wireless. Against the hundreds of thousands of amateurs operating in the United States, there are only something between 7,000 and 8,000 amateurs in England, it is estimated.

It is claimed that amateurs cannot get practice, and that wireless, if not fettered, would be as popular in England as it is in the States. The view held in radio circles is that the Post Office is not responsible in the matter of restrictions, but that they are a buffer between the public use of wireless and the old-fashioned notions of its use only for the Navy, Army and aviation.

Radio amateurs, however, are in hopes that better days are coming to them. The matter has been taken up in Parliament, where Sir Douglas Newton, who has had radio apparatus in his house for the last fifteen years, has questioned the Postmaster General. Sir Douglas Newton asked if he were prepared substantially to modify and relax, at an early date, the existing regulations, and if he would sanction the broadcasting daily of messages likely to benefit trade and industry, or of general public interest. In reply the Postmaster General said that the whole question was being referred to the Imperial Communications Committee, so that the views of the departments concerned might be obtained as early as possible. He added that he was himself entirely sympathetic with the idea.

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Germany's R.R. Radio

WIRELESS telephone instruments will be installed on a number of important German express trains, and receiving instruments will be placed in hotels and embassies, according to an announcement made recently.

Experiments have shown the practicability of it. Men engaged in the testing of the instruments were able to hold conversations with friends in Berlin from moving freight trains. The tests were made under the obsercation of engineers, military attaches and the diplomatic representatives of the United States and Sweden.

It is planned for travelers on express trains to reserve hotel accommodations by radio.

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Chinese Commercial Station

WHAT is presumed to be the longest commercial radio telephone circuit in the world has been placed in operation in China. Radio sets have been installed in Pekin and Tientsin, which are approximately ninety miles apart, and have been connected with the Government telephone lines.

In the past, Pekin has been virtually deprived of long-distance telephone connections with other cities in China, due to few interurban lines in operation out of the capital, in face of many demands for service. And the new radiophone circuit is the first large step toward simplifying China's telephone problems. The apparatus was provided by the International Western Electric Company and manufactured in the laboratories of the Western Electric Company, New York.

The sets are so arranged that when a telephone subscriber in Pekin wishes to make a Tientsin call, he will call the Pekin operator in the usual manner, and Tientsin is signaled over the radio channel. The Tientsin operator in turn makes the necessary connection and the conversation takes place. So far as the operation of the system is concerned, the procedure is no different from what it would be if wire connections were provided throughout.

English operator directing traffic at big race meet by wireless

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One Radio Language

CONSIDERABLE comment has been heard recently about the advisability, or rather, the necessity of formulating a world-wide radio language, as intelligible to the Japs and Germans as to the English and French.

The world is rapidly being linked together by radio and space no longer is a factor in the speed with which messages flash from one people to another. Those in Alaska can converse via the wireless telegraph to the White House in Washington. Washington can get Nauen, Germany, on the air quite as easily as it can get Chicago.

Trained minds in European cities are considering the question of developing a universal language that will adapt itself to code work. Diplomats feel certain, according to reports, that such an undertaking, successfully accomplished, will do much to pacify the many different kinds of peoples on the Continent, in Asia, and in the Far East.

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Venezuela Hears Pittsburgh

AN idea of the vast distance over which radio concerts may be detected and the number of people who are benefited by the entertainments which fill the air nightly is indicated in a letter recently received by the KDKA broadcastng station of the Westinghouse Electric and Manufacturing Company, at Pittsburgh. The letter is from Arthur H. Williams, who is employed in the American Consulate, La Guaira, Venezuela.

Mr. Williams said that while listening in at a Venezuelan government station "AYG" which is situated at Maiguetia, a suburb of La Guaira, he is able to hear broadcasting from Pittsburgh. With a loud-speaker attachment it comes in loud enough to fill a large room with music.

The station at Maiguetia is about 1,850 miles from Pittsburgh, but concerts are picked up there without difficulty. The station is equipped with a vacuum tube receiver and a two-stage amplifier.

RADIO Broadcasting soon is to be introduced into Asia Minor. The man who will be responsible for carrying the latest American development into the Near East tells of his thirty-one years of experience over there. He is

Dr. Alexander MacLaughlan

President of International College at Smyrna

DR. Alexander MacLaughlan is far too unassuming to even suggest that he will be the man to introduce radio broadcasting, as we know it here in America, to the Near East, but the fact remains just the same that without question such will be the case.

For thirty-one years this most unusual man has been closely identified with the educational and spiritual progress in the Near East. Born on a farm near Toronto, Canada, he is the product of the Queens (Canadian) University, and the Union (American) Theological Seminary. It was shortly after being graduated from the latter that he received the call to Turkey, and ever since 1891 when the institution of which he now is president was established, has he been identified with the International College at Smyrna.

The International College is an American institution. It is one of the important factors helping to break down the bitter prejudice that exists largely between the many peoples of that part of the world.

"The American institutions," says Dr. MacLaughlan, "and I myself, are not 'pro' any particular group. We are 'pro' every group, and for that reason we are able to accomplish considerable. We have been literally setting the pace. So that it is only natural, I suppose, that we will want to introduce the newest and one of the most wonderful arms of science—the radio telephone.

"NOT one in a thousand has ever heard of the radiophone over in Asia Minor," says Dr. MacLaughlan.

"We will prove to them it is an accomplished fact, and we hope that it will be one more link in the chain that will weld the many peoples together into a bond of common fellowship."

Dr. MacLaughlan left New York early in May for England, his first stop on his way back to Turkey.

Constantinople, where broadcasting may be introduced

"In our institution there are perhaps twelve to fifteen races represented. There are nearly as many different ones on our faculty. These include Turks, Greeks, Armenians, Jews, and many others.

"Each group has been taught at home to be distrustful of the others. But they all come to the College and there the sons of Turkey play handball and football with those of Greece, and there discover that instead of being someone to dislike, their neighbors are good fellows, likable fellows. That is helping to break down the barriers that used to exist.

"There is no more wonderful way to help break down these prejudices, to bind the human race into a common fellowship, than the radiophone. Think of its growth! Two years ago I was in this country last. Then, to the public, it was an unknown thing. And now it is here, a reality.

"Not one in a thousand has ever heard of the radiophone over in Asia Minor. They will scoff at the idea of being able to transmit the voice for many miles. But we will equip ourselves, if it is at all possible, with a low-powered transmitting station and several receiving sets, and we will show them it is an accomplished fact. It will do much to weld together the many peoples over there, I feel sure. We will be able, possibly to broadcast the religious services. Perhaps we can form a three-cornered broadcasting arrangement between Smyrna, Constantinople and Athens.

"I can recall when we set up, some fifteen years ago, a wireless set within the college. In one room we put the sending apparatus, and in another the receiving set. We made a small bell ring, and hundreds came to marvel, many insisting we had wires strung between the two points.

"Of course, we have wireless in general use over there. The German government built a large station nearby during the war, and it was used for military and political purposes. But general use of the radiophone to broadcast music and other things is unheard of as yet, and it will be up to our American institutions to pave the way."

Dr. MacLaughlan believes that not only will radio materially assist in bringing about a better understanding in the Near East, but that everywhere throughout the world will it have that effect. The political situation in the Near East is highly complex, he adds, but with radio an accomplished fact, there is no such thing as being alien; the people hundreds of miles away are nearby neighbors, and this will have, he believes, an astonishing reaction in the relations and affairs of the world. It will bring the people closer together.

Radio at North Pole

SECRETS of the North Pole are to be unlocked by the airplane, the camera and the wireless telephone.

"Modern instruments of science," says Captain Ronald Amundsen, "will give to the farmer, the manufacturer and the seafarer information of incalculable value of the Far North's mysterious effect upon conditions here."

He is preparing a four years' expedition to the North Pole. Amundsen is the discoverer of the South Pole.

"By ship I shall float with the ice fields over the roof of the world," he said. "Airplanes will take us over the North Pole. With movie cameras we will get a photographic record that will never perish. And by radio I shall be in daily touch, if necessary, with civilization, relaying reports that otherwise would be hidden for years."

Amundsen says science has made easy the path of the explorer.

"From the ship we can sail by airplane over a radius of 100 miles," he says, "observations of upper air conditions and photographic maps will be easily made. Our radio will keep us in constant touch with the world.

"The best of it is that our information will not be stale when we send it back. Our radio will take care of that.

"Our daily radio reports on the weather, the water, the air and the ice of the North Pole may have distinct value to the people of the United States and Europe.

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Concert in Prison

RADIO has penetrated prison walls. Inmates of the Detroit House of Correction have listened to a radio concert. The House of Correction set is installed so that it can be operated either in the chapel which seats 300 inmates, or in the cell blocks.

The first number on The Detroit News program, to which the inmates listened, was the Lenten sermon by the Rev. W. E. Bowyer, pastor of the Warren Avenue Baptist Church. The clergyman was given appreciative hearing, as was the Rev. Gaius Glenn Atkins, who spoke on the Woodrow Wilson Foundation. The inmates enjoyed the vocal solos by Miss Emily Frawley and Lou Kennedy, and the saxophone solo by Joe Benke.

Broadcasting Stations

KYW—360 meters. Daily, 8 P.M. Central time, 9 P.M. eastern time. Westinghouse Station located at Chicago, Ill.

KDKA—360 meters. Daily, 8 to 10 P.M. Westinghouse Station located at East Pittsburgh.

WBZ—360 meters. Sundays, Mondays, Wednesdays and Fridays, 8 P.M. Westinghouse Station located at Springfield, Mass.

WGI—360 meters. Evenings. American Radio and Research Corporation station located at Medford Hillside, Mass.

WGY—360 meters. No schedule. General Electric Co. station located at Schenectady, N. Y.

WJZ—360 meters. Daily, 11 A.M. to 10 P.M. Radio Corporation-Westinghouse Station located at Newark, N. J.

WVP—1450 meters. Evenings, 9 to 9.55 o'clock, except Sundays and Holidays. Signal Corps, Bedloe's Island, New York Harbor.

Stations Broadcasting Music and Speech on 360 Meters

AGI	Signal Corps, Presido	San Francisco, Calif.
DDV	Noble Electric Works	Monterey, Calif.
IOJ	Raymond F. Farhans	Pawtucket, R. I.
KAO	Young Men's Christian Association	Denver, Colo.
KDN	Leo J. Meyberg Co	San Francisco, Calif.
KFC	Northern Radio & Electric Co.,	Seattle, Wash.
KFI	E. C. Anthony	Los Angeles, Calif.
KFU	The Precision Shop	Gridley, Calif.
KFV	Foster Bradbury Radio Store	Yakima, Wash.
KFZ	Doerr Mitchell Elec. Co	Spokane, Wash.
KGB	Wm. A. Mullins Electric Co	Tacoma, Wash.
KGC	Electric Lighting & Supply Co	Hollywood, Calif.
KGF	Pomona Fixture & Wiring Co	Pomona, Calif.
KGN	Northwestern Radio Mfg. Co	Portland, Ore.
KGO	Altadena Radio Laboratory	Altadena, Calif.
KGU	M. A. Mulrony	Honolulu, Hawaii
KGW	Oregonian Publishing Co.	Portland, Ore.
KGY	St. Martins College	Lacey, Wash.
KHD	Aldrich Marble & Granite Co	Colorado Sps., Colo.
KHJ	C. R. Kierulff & Co	Los Angeles, Calif.
KHQ	Louis Wasmer	Seattle, Wash.
KJC	Standard Radio Co.	Los Angeles, Calif.
KJJ	The Radio Shop	Sunnyvale, Calif.
KJQ	C. O. Gould	Stockton, Calif.
KJR	Vincent I. Kraft	Seattle, Wash.
I'IS	Bible Inst. of Los Angeles, Inc	Los Angeles, Calif.
KLB	J. J. Dunn & Co.	Pasadena, Calif.
KLN	Noggle Electric Works	Monterey, Calif.
KLP	Colin B. Kennedy Co.	Los Altos, Calif.
KLS	Warner Bros.	Oakland, Calif.
KLZ	Reynolds Radio Co.	Denver, Colo.
KMC	Lindsay-Weatherill & Co	Reedley, Calif.
KMJ	San Joaquin Light & Power Co	Fresno, Calif.
KMO	Love Electric Co.	Tacoma, Wash.
KNJ	Roswell Public Service Co	Roswell, N. Mex.
KNR	Beacon Light Co.	Los Angeles, Calif.
KNV	Radio Supply Co.	Los Angeles, Calif.
KOB	New Mexico College of Agriculture and Mechanical Arts	State College, N. M.
KOE	Spokane Chronicle	Spokane, Wash.
KOG	Western Radio Electric Co	Los Angeles, Calif.
KON	Holzwasser (Inc.)	San Diego, Calif.
KOP	Detroit Police Department	Detroit, Mich.
KOQ	Modesto Evening News	Modesto, Calif.
KQL	Arno A. Kluge	Los Angeles, Calif.
KQP	Blue Diamond Electric Co	Hood River, Ore.
KQT	Electric Power & Appliance Co	Yakima, Wash.
KQV	Doubleday-Hill Electric Co.	Pittsburgh, Pa.
KQW	Charles D. Herrold	San Jose, Calif.
KUO	The Examiner Printing Co	San Francisco, Calif.
KVQ	J. C. Hobrecht	Sacramento, Calif.
KWG	Portable Wireless Telephone Co	Stockton, Calif.
KYY	The Radio Telephone Shop	San Francisco, Calif.
KYJ	Leo J. Meyberg Co.	Los Angeles, Calif.
KZM	Preston D. Allen	Oakland, Calif.
KZY	Atlantic-Pacific Radio Supplies Co	Oakland, Calif.
WBU	City of Chicago	Chicago, Ill.
WCJ	A. C. Gilbert Co	New Haven, Conn.
WDM	Church of the Covenant	Washington, D. C.
WDT	Ship Owners Radio Service	New York, N. Y.
WDW	Radio Const. & Elec. Co	Washington, D. C.
WFO	The Rike Kumler Co	Dayton, O.*
WGH	Montgomery Light & Water Power Co.,	Montgomery, Ala.*
WGL	Thomas F. J. Howlett	Philadelphia, Pa.
WHA	University of Wisconsin	Madison, Wis.*
WHK	Warren R. Cox	Cleveland, O.
WHQ	Rochester Times Union	Rochester, N. Y.*
WHU	William B. Duck Co	Toledo, O.
WHW	Stuart W. Seeley	East Lansing, Mich.*
WJH	White & Boyer	Washington, D. C.
WJK	Service Radio Equipment Co	Toledo, O.
WJX	DeForest Radio Tel. & Tel. Co.,	New York, N. Y.
WLB	University of Minnesota	Minneapolis, Minn.*
WLK	Hamilton Mfg. Co.	Indianapolis, Ind.
WLW	Crosley Mfg. Co.	Cincinnati, O.
WMH	Precision Equipment Co.	Cincinnati, O.*
WOC	Karlowa Radio Co.	Rock Island, Ill.*
WOH	Hatfield Electric Co.	Indianapolis, Ind.
WOQ	Western Radio Co.	Kansas City, Mo.*
WOK	The Pine Bluff Co.	Pine Bluff, Ark.
WOU	Metropolitan Utilities District	Omaha, Neb.*
WOR	L. Bamberger & Co	Newark, N. J.
WOS	Missouri State Marketing Bureau.	Jefferson City, Mo.*
WOZ	Palladium Printing Co	Richmond, Ind.*
WRK	Doron Brothers Electric Co	Hamilton, O.
WRL	Union College	Schenectady, N. Y.
WPB	Newspaper Printing Co.	Pittsburgh, Pa.
WSZ	Marshall-Gerken Co.	Toledo, O.*
WWJ	The Detroit News	Detroit, Mich.*

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* Stations broadcasting market and weather reports on 485 meters in addition to music on 360 meters.

Newspapers Want Re-Allocation

THE importance of newspaper broadcasting was recognized by the radio conference when Dr. S. W. Stratton, chairman, favored reallocation of the wavelength band in which newspapers operate.

This was also favored by Chief Radio Inspector W. D. Terrell of the Department of Commerce.

Newspapers at present are classed with owners of private stations, stores and communication companies. In the various cities they are obliged to operate within small sections of the allocation between 310 and 435 meters.

It was represented to the conference that because of the extensively public nature of newspaper broadcasting, newspapers should not be classed under the private designation. It was pointed out that universities, whose broadcasting is of a limited range as compared with newspapers, are classed with State and Government stations as public broadcasters.

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At the 18th Hole

MEMBERS of the Dixmoor Golf Club, of Chicago, will now satisfy both their desire to play their favorite game on Sunday and at the same time look after their spiritual welfare. A radiophone has been installed in the club house, at the suggestion of the local pastors, who claim that their congregations prefer golf to church. O. C. Upham, president of the club, solved the problem by saying that as the golfers could not be brought to the church, the church will be brought to the golfers, via radiophone. A contribution plate will be placed at the 18th hole.

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Tune In for the 3-Alarm!

LIFE around the firehouse between fires is more interesting these days. Radio did it.

Radiophones have begun to interest firemen throughout the country. Concerts, lectures and messages from ships at sea have been received by firemen, who have rigged up wireless telephone apparatus at the stations.

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"All Modern Improvements"

CERTAIN real estate dealers in Philadelphia are equipping houses with complete radio receiving sets. The sales of suburban homes have been increased by this innovation.

"I could visualize my audience separated into thousands of tiny theaters—the millionaire, the lumberjack, the backwoodsman—all listening to the same song. What an audience!"

Those were the thoughts that flashed on the occasion of her first broadcasting, to

Olga Steck

and she describes them vividly in the following interview

With Maurice Henle

There is nothing theatrical about Olga Steck's appearance.

NOT only is Olga Steck one of the radiophone broadcast pioneer artists, but she is the prima donna in the first American musical comedy production having a "radiophone number."

That gives her broadcasting impressions double interest, to radio fans as well as theatergoers. In introducing her by picture and printed word to the thousands of listeners who have heard her voice in the air, let it be said that she is a very charming, pretty and winsome little lady with a speaking voice as clear as her rich soprano notes, and a personality that vitalizes every thought expressed.

Conversationally, she told me that it was not long ago, less than a year in fact, that she reached Broadway from sunny California. Out there she was a great favorite in musical plays. But it seems that a theatrical light is only a glimmer until it has shined on the Gay White Way. And so Miss Steck reached the Big Town for greater triumphs.

Then, one evening, after she had been in New York for a few months, her former musical director who, along with a sizeable section of the public, had been dazzled by the star's eyes and voice, telephoned her and extended an invitation to sing over WDY, the Roselle Park station.

She accepted right there and then, with a mental murmur that the inventor of the phrase that "there is nothing new under the sun," didn't know what he was talking about.

Here was an experience!

But let Miss Steck tell you:

"There were only a few of us in the broadcasting studio. I had selected several numbers to sing. The announcer spoke into what looked like a regular telephone, motioned me toward the singer's stand, and then the piano accompanist began to play.

"No One In Sight"

"I want to confess I felt rather foolish at first singing into that queer little megaphone thing. No one to sing to. Not a soul in sight, not a sound to indicate an audience was present, and only the few members of our party to 'humanize' the performance.

"Should you suddenly stumble onto someone singing fervently to a tree, or a brick wall, or possibly a tree stump, you would laugh. I know I would. Not the idea of singing. But the thought of his singing to empty space.

"I felt in pretty much the same position. I could not tell who was listening; I was not even certain that anyone was. But somehow or other I convinced myself that the gods were not playing a practical joke on me and I finished the evening."

She threw back her pretty head and laughed merrily at the recollection. And then she immediately became serious again.

"But the next few days brought many hundreds of letters from those who had heard, those who were somewhere out in the black night listening, those who expressed their appreciation with far more vigor than ever comes back over the footlights in applause.

"It was a big moment in my life, and I thought about it seriously. And every time since then, when I have broadcasted, I remember that I have an audience, an audience, at home and in homes, separated into hundreds of thousands of tiny, so to speak, theaters, each holding a small, select audience.

"I know that I am being heard in a luxurious Park avenue home. I know that my voice is being listened to in stuffy rooms of crowded tenement houses. I see a vision of listeners in hamlets, along the highways and by-ways of sleepy country lanes. And I see the rough lumber-jack, the weary coal miner and the backwoodsman — all listening to the same song.

"What an audience! Anyone would be thrilled!"

And her whimsical, delicately molded eyes half closed as if she were seeing the picture she had sketched so vividly.

"Miss Steck!"

Action! She was called from her vision by an insistent stage director, who, on the nearby stage, was rehearsing Bide Dudley's new musical comedy, "Sue Dear," the vehicle in which she holds the titular role.

It is this play that has the radiophone sing, which Miss Steck's rich soprano voice delivers with great success. The play, written by Bide Dudley, well-known newspaperman, and C. S. Montanye, with music by Frank H. Grey, opened several weeks ago in Stamford, Conn. From there it went to Atlantic City before heading for New York City and Broadway.

Public To See Her

"Say It By Radiophone" is the name of the number. A large amplifier has been placed in the audience. The dainty Olga sings the song, assisted by Albert Derbil and the Ritz Male Quartet. Then she goes off stage, and the audience hears the chorus sung again by Miss Steck, but this time she is in her dressing room.

And even then her personality fills the auditorium, just as it projects itself through the ether and over the radiophone. And I was glad that the public, the immense broadcasting audience, will have the opportunity of actually seeing her in "Sue Dear," which makes first use of the radiophone idea on the American stage—just as I have inadequately pictured her here.

John C
Freund
Editor
Musical America

"Cheer Up! Never mind your troubles. Remember the greatest thing in life is leisure, leisure won by hard work. Music by radio can help us to escape the monotony of daily toil, develop the mind and bring happiness into our lives"

Excerpts from an address broadcasted from WJZ

John C. Freund

Maintains that radio will be a potent force in bringing music home to the masses

WHAT'S the great world cry today? It is "We want a better life!" That cry comes from the harassed so-called captain of industry bowed under his burdens as it comes from the harassed wage-earner trying to make both ends meet with falling wages and the rising cost of living.

What are you all getting out of life anyway? — Life! — God's greatest gift to man!

You go from home to office or store or factory on foot, by car, by subway, or elevated, over a ferry perhaps; in the middle of the day you take a little time off to swallow a meal which may be a good one or may only consist of a sandwich or some ice cream, and if you are female, you lighten it up with a powder puff and a lipstick. Then back to work and home again by car, by subway, or elevated, over a ferry and by the time you are home, most of you haven't the pep left to enjoy the leisure that you have won and so many of you instead of indulging in some rational social life or going to hear some good music or a good play, off you go to the movies, a vaudeville show or a cabaret where you shimmy and fox-trot to the music of the jazz, preferably with somebody else's girl or wife.

You haven't yet been educated to realize that the end and aim of life should not be work, work all the time but leisure, leisure to spend a little time with your family, if you are married, to get acquainted with your own children instead of telling mother to put the kids to sleep as you smoke a pipe, read the latest murders and suicides in the evening papers and so to bed to prepare for the next day's monotonous toil, for monotonous it is for nearly all of us — same faces, same stunt, same roll-top desk, same job at the factory, same stenographer to look at, pretty or otherwise, as you dictate if you are a business man your ever-increasing monotonous replies to the correspondence you receive which generally begins: Dear Sir: Yours of the tenth duly to hand, etcetra, etcetra —and so it goes.

The great facilities of travel and living, the great inventions are making all our lives more and more monotonous. Do you realize that?

Formerly a shoemaker made a shoe, the whole shoe. If he was in a small town, he was the center of the scandal and the news. He knew your corns and your bunions and your troubles.

Today, through labor-saving machinery, a man or a woman stands or sits at a machine and does one little job eight hours a day, six days a week, fifty-two weeks in the year. Soul benumbing labor. Do you realize how awful that is?

It is to escape this monotony that men try to smoke themselves to death while playing penny ante while the women murder one another's reputations at sewing circles or mothers' meetings, while the young people get out into the streets and pair off like the birds, go ice-creaming and tangoing as if that was the best way to prepare them for life or their work.

Wherever you go, you find human energy expended just after the day's work is done in an endless number of ways that are positively infernal because of their stupidity. Of all the things that can help make life unreal, it is the movies which must have the happy end where after several acts of villainy, all is well when someone taps the villain on the back and tells him to be a good boy in the future.

Music can help you!

Hitherto good music has been looked upon as something just for the educated few who go to hear the symphonies, the opera, the great artists.

Music belongs to all!

It begins where words end — it whispers to us of immortality.

And it came out of the mass soul in the shape of the folks songs, the songs of the people.

It didn't start as an art.

That's why some of us are trying to give it back to the people, to democratize it.

Some believe that classical music is the only good music.

Rats!

Good music may be a lovely waltz by a great composer or a homely ballad or a quartet or a chorus, though a chorus must not be a drinking song, for, like some of the rivers, we have gone dry, that is those of us who are so by conviction or under doctor's orders.

The main thing with music is to have it in the home, not alone in the church or in the concert halls but in the home whether it comes in the shape of a talking machine, a player-piano or a radio set.

Let me tell you mothers and fathers, that with music in the home, the boy will bring in a better type of girl and the girl will certainly bring in a better type of boy. To you girls, let me say that if you have any fellow who threatens to be a "steady" and who can't stand a little good music, take an old man's advice and — fire him.

Did you know that a multi-millionaire one day passing along the street heard the sound of violin playing. Curiosity brought him into the place and he found a little, fat, freckled boy scraping away. He became interested in the boy, gave him a chance. That boy later became a multi-millionaire himself and one of the great characters of these United States. The name of the man was Andrew Carnegie and the fat, freckled boy is Charles M. Schwab, head of the Bethlehem Steel Works, where at times they have from fifteen to twenty thousand employees. It was his music which gave him a chance.

Let us not forget the radio which already has millions of auditors and will be a most potent force to bring music home to the masses.

Baldwin, the Phone Maker

NATHANIEL BALDWIN of Utah is the man from whom the Baldwin receivers get their name. His product has become so widely known that a few words about its origin and a word picture about the inventor himself will not be amiss.

Baldwin radio products are manufactured in Salt Lake City. They have been manufactured there for the past eight years. Mr. Baldwin, native of Utah, has been working steadily and his reward is coming in now, for his telephone receivers are becoming famous and the clamor for them is far beyond the capacity of his small factory. But the inventor and manufacturer is not excited or enthusiastic over this rush of orders.

"I don't know why there should be any story written about our work out here," Mr. Baldwin good humoredly told a newspaperman recently.

It is not easy to find the Baldwin Radio factory. It is not in the factory district of Salt Lake or even in the city proper. Even the street is not paved. There is no high smokestack to mark the site. Near the road there is a modest little cottage, the home of the owner of the plant. Across the street is a long one-story frame building, built on the order of temporary quarters put up by construction companies. Beyond it are several other similar buildings. These are parts of the factory. Sheet iron or tin pipes protrude a few feet higher than the low roofs; these are outlets from small stoves that furnish heat.

But the interiors of these buildings are busy places. Last September there were less than forty men employed by Mr. Baldwin. The popularity of his wireless telephone receivers was just then beginning to spread. He built additions to his frame factory buildings, the different stages being plainly visible by the stage of discoloration from weather on the rough pine boards. No paint has been wasted on the exterior of these buildings.

The farmers who applied for work were given it, until now there are 110 men employed, and only space limitations prevent the employment of more. The orders are far beyond the capacity of the plant.

Mr. Baldwin is a native of Fillmore. He went to school in Provo and attended the Brigham Young University and later taught there. Then he became interested in electricity and invented his telephone receiver. He has made other inventions and the factory does other work besides making these receivers, but it is the wireless telephone receiver that is making him famous. He has different types for different lines of work, and the receiver will work also with wire telephones.

Mr. Baldwin is said to be democratic in some of his ideas. It is reported that he drives a low-priced car because that is all that the men working for him can afford and he does not want to be conspicuous. He has not gone out into the world for his mechanics, but has taken in the farmer boys of the neighborhood and trained them in his own way and to his own efficiency.

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Ford Gets License

HENRY FORD may yet tell "flivver" owners of the intricate methods of "flivver" operation by wireless phone. The Department of Commerce has announced that Ford has been granted permission to operate a broadcasting wireless phone at Dearborn, Mich. His call is WWI.

Henry Ford (seated) listening in at Atlanta (Ga.) newspaper office

New York Police Plans

PLANS to equip the patrol automobiles of the New York City Police Department with radiophone apparatus is announced as part of a war on bandits.

Negotiations for the wireless equipment, it is understood, have been conducted by Michael R. Brennan, superintendent of telegraph of the police department. Provision is being made for a broadcasting station that will keep in touch with all police automobiles at all times of the day and night, whether traveling at high speed or standing still.

It is proposed to make use of a wave length that will permit of no interference by amateurs or high-power broadcasting stations. In each automobile one policeman will have receivers constantly to his ears and will be able to talk to headquarters.

To prevent the possibility of crooks listening in, the police broadcasting will be done largely in code.

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Concerts for Doctor's Patients

RADIOPHONE concerts for patients while waiting in the physician's office is the most up-to-date use found for the radiophone. Dr. Paine FitzGerald of Boston is the physician who has long been a radio "bug," and now entertains his sick patients with music and lectures while waiting to see him in his office.

Dr. FitzGerald says it is wonderful the way the scheme works. A patient comes into the doctor's office and is first ushered into a lounging room, in one corner of which is a big graphophone and opposite is the radiophone receiving set.

The patient is naturally feeling blue and sick at heart as well as body. Either the doctor or Mrs. FitzGerald takes a seat at the radiophone and plugging in starts tuning up to catch Medford, Pittsburgh or Newark. The patient's mind is immediately taken up with the wonder of the new invention, which is explained to him while pop-eyed he hears songs sung thousands of miles away.

✦ ✦ ✦

Aiding the Farmer

THE importance of radio to the farmer is becoming more apparent every day. It is asserted that the radio not only makes the isolation of the farm a thing of the past but brings quickly to the farmer the agricultural information needed in the intelligent operation of the farm.

W. A. Wheeler, delegate to the radio conference in Washington, says: "There are more than 32,000,000 people on farms, comprising nearly one-third of the total population of the United States, most of whom are located where they are practically cut off from immediate contact with the outside world. The radio is the only means of getting to them quickly, at small cost, the economic information necessary in the proper conduct of their business."

The time element in dispatching weather, crop and market news is a big factor affecting the value of such reports.

The Sunday Sermon

OUT in Jamesburg, N. J., which is just a tiny dot on the map, lives the family of Mrs. George A. Shultz. She did not get to church on Sunday morning as often as she would have liked, she told friends. Something always interfered. And then alone came the radiophone, and the broadcasting of a Sunday service.

"The Sunday service will be a wonderful blessing," Mrs. Shultz says. "My whole family listen in and enjoy it as much as if it were in the church itself."

And Mrs. Shultz's enthusiastic words lead to a bigger thing. Will the minister of the future deliver his sermon over the ether? He is doing it today, but not universally. Will he recognize that he will reach an audience of hundreds of thousands via the radiophone? Indications are that he will, for as yet no sign has come from the clergy that it is displeased with this new means of spreading happiness and education.

In fact, the opposite seems to be the truth. Ministers everywhere are interested, and while many have not tried the new delivery as yet, they show unmistakable signs of doing so in the near future.

It probably will boil down to the broadcasting of one service each week for each of the various religions. There is no question but that the influence will be one of good, for thousands who now do not attend church, who have not attended for a long time, will have their interest re-awakened.

The leader of one New York's most famous orchestras, a distinguished looking gentleman, whose name cannot be mentioned for obvious reasons, is a radio fan, and a rabid one at that.

"What one thing pleases you most of all with radio?" he was asked. His musical criticism was eagerly awaited.

He shifted his black cigar from one corner of his mouth to the other.

"Well," said he, "I guess the most appealing thing about it is that I can attend divine services and still smoke my cigar."

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A Word About the Shut-Ins

TO amuse the old folks, to interest the growing youth, to heal the sick, to instruct and inform everyone—these are the purposes of radio. This is brought out every day by the latest of those caught in radio's glamour.

The part that it will play in healing the sick cannot be over-estimated, according to Dr. C. O. Probst, of Columbus, Ohio, who says that more than 1,500 tuberculosis patients in the vicinity would be materially aided by the installation of radio sets, and that he is working toward that goal.

"The fact that patients have nothing to do, nothing to think about," he says, "and have little intercourse with the outside world, is detrimental to their recovery.

"Radio concerts and news by this latest means of communication would go a long way toward making the load of a tuberculosis sufferer lighter. By putting these sufferers ,especially the bed-ridden ones, in touch with the outside world, radio will have accomplished a real purpose."

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The Younger Generation

SPEAKERS also point out that the "street corner boy" is becoming a thing of the past. They point out that the youth of today has too much to occupy his mind and not the least of these is radio. They refer often to that old wheeze about the man who was talking to a companion. Both were substantial, wealthy citizens of their community.

"Say, Jim," said one, "What do you know about this radio thing?"

"Not a thing, George," the other replied, "but my nine-year-old boy can tell you all about it if you want to know."

This boy question is indirectly reflected in the press comment of the country every day. Says one writer concerning radio:

Get on the radio band wagon. Everybody's listening in the world around, and you must keep up with the procession.

Radio is a hobby that is worth while.

Here are a few of the things it will do for you:

1. It will make your home up-to-date with radio concerts, dances, sermons, news, market reports, lectures, addresses.
2. You will use your spare time in a way that will do you good and teach you something worth while.
3. Radio leads you by easy stages to a vocation with plenty of thrills and fat pay envelopes.
4. Radio prepares you for service in the army, navy and marine corps, aero squadron, merchant marine, commercial station, railroad system, fire department, police department, summer camp, hotel, stock exchange and government systems.

The government is right behind the boy who takes up radio seriously. The United States signal corps, United States army, is ready to teach it to the earnest boy.

Boys who reach a certain prescribed standard are eligible for invitations to attend an army camp for two weeks in the summer, free of charge.

The navy does not forget the radio boy either. For three years they have had a system for them and thousands are registered with the Radio Amateur Bureau of the Third Naval District, New York city.

From time to time other opportunities for radio boys in connection with the government will develop.

Now, how you can start?

1. Decide whether to buy or build your receiver. It will cost time, but less money if you build it. But you will probably have a better receiver if you buy it.
2. Start working out your plan and stick to it.
3. Send to the superintendent of documents, government printing office, Washington, D. C., for the following pamphlets:

(a) Document No. 1055, Elementary Electricity, 10 cents.

(b) Document No. 1064, Elementary Principles of Radio Telegraphy and Telephony, 15 cents.

These two pamphlets will let you know what is going on inside your apparatus and that will make you a better operator. The government has secured experts to write these pamphlets and you could have no better guide.

(c) Radio laws of the United States and International Convention, 15 cents.

This contains the international Morse code, which is used in most radio transmission, and the list of "Q" signals or radio abbreviations used by all operators.

4. When you get discouraged, which will be often at the start, rest half an hour and try again.

Remember, radio is the one big modern science that a boy can use as well as a man. At least 250,000 boys are working at radio right in their own homes in the United States of America.

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Appeal for Help By Radio

RADIO brought relief to the stricken city of Beardstown, Ill., which was caught when the Illinois River recently reared over its banks and rushed over occupied land. To cap the climax a levee was reported to have broken and all parts of the city caught by the flood waters.

A relief committee immediately dispatched telegrams to all parts of the country asking for relief. To supplement this, an appeal was broadcasted from various points of the country, and it is estimated several million people were informed of the city's distress by this method. Local radio stations throughout the country were asked, in the broadcasted appeal, to copy the message and to inform their home town newspapers. And so, no part of the country, however remote, was uninformed of the suffering in Beardstown.

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Interplanetary Radio Far Distant

POSSIBILITY of interplanetary radio communication is distant, says Professor J. A. Fleming, of the University of London. An electrified dust screen thrown off by the sun keeps the radio waves down to earth, while lack of such a screen around the moon makes that satellite unfit for long distance radio communication.

✦ ✦ ✦

Radio Movies?

TRANSMISSION of motion pictures by radio to the homes of the present generation is predicted by E. L. Eastman, director of the KYW radio station.

"We have sent pictures by wire already," he said, "and anything that can be sent by wire can be sent by radio."

Billy Jones Says:

People Want What They Want When They Want It. And Most of the Time That Is Popular, Light Songs That Leave Them Whistling And Happy

Popular and jovial phonograph artist, in an interview with Edwin Hall, explains his creed of laughter, and therein lies the explanation as to why Billy has become one of the most widely known singers of popular comedy songs

I KNEW Billy Jones, the popular comedy singer, when he was a kid up in Brewster, N. Y. That was before the Flood—of Radiophone popularity.

Much water has flowed under the Brooklyn Bridge since then, tons of toasted corn flakes have been devoured for breakfast, a World War has been fought, W.J.B. has stopped running for President, and little Billy Jones has developed into one of those amazingly rare tenors who actually are so busy they hardly have time to give interviews. But I had heard him on the air several evenings, singing at WJZ, and told him he must talk for publication, so readers of THE WIRELESS AGE might know him better.

Billy is busy because he sings for twelve — get this — twelve phonograph recording companies. He confided this over a cup of coffee and between sips explained that he takes a jaunt around a vaudeville circuit or two just to keep the good habit. In his spare time, he dashes off a new song, grabs a sandwich, and — occasionally — a little sleep.

That was Billy's daily and rather appealing routine of affairs when the big radio zeppelin began to bombard this country with its WJZ's, its KDKA's, and its WGI's. Of course, Bill's services were immediately desired, and just as he eagerly took up Uncle Sam's cause during the late unpleasantries, just so did he respond to the broadcast call.

LOVES COMEDY AND HUMOR

He put it over with a bang, and those who read these lines will recall the evenings of enjoyment he has contributed. It is only natural that, loving comedy and humor, he should get a large amount of fun out of his broadcasting and receiving experience . . . of course, like everyone else, he has installed a receiver in his home.

The sensations in singing into the broadcast transmitter are no different than those one gets in singing for the music records. In neither instance has one a visible audience. So in that respect he had nothing new to get used to, and it handed him a laugh, he says, to watch how nervous some of the artists became while singing into the little horn-like transmitter.

A characteristic Billy Jones Smile

"THEY WANT TO LAUGH"

"The trouble with most of them," he said earnestly, "is that they all want to sing grand opera. Get away from it! The people want something light; they want to laugh."

Billy received a letter from someone who had listened in out in Pennsylvania, a letter which was the outcome of an argument the writer had with his wife. The wife wanted to wager the next day's breakfast, or something, that Billy's singing partner that night, Ernest Hare, was tall and slim, fully six feet, whereas Billy himself was very short and plump. And he was willing to wager — for the retention of the said breakfast—that the opposite was true.

"For goodness sake," the man wrote, "send a picture of you two, and let me win one argument from my wife."

Billy assured him both Mr. Hare and himself were neither very tall nor very short, and that therefore neither won.

Incidently it might be mentioned that Jones answers every radio letter he receives, and he is seriously considering hiring a social secretary, so heavy has the mail become.

At the beginning of this sketch I mentioned that Billy came from Brewster, N. Y. The folks up there always knew that the little choir singer with the unusual voice would get some place, and they were satisfied their predictions were good ones when they listened in and heard his voice over the radiophone.

Billy likes to do his own announcing — all artists do for that matter — and when he does he injects the humorous element. He will mention by name any one of his friends he knows to be listening in. Every mail brings letters asking who is the party in Larchmont with whom he is always joking. I tried, also, to find out, but had to be satisfied with a Ha! Ha! and a He! He! So it may merely be speculated that someone has completely won the comedy tenor's heart, and has bought a radio set because Billy broadcasts.

Speaking of love, he is convinced now that Romeo, Michigan, is well named. One night he was singing one of his latest compositions, "Love Her By Radio." A couple of days later he received a response; 'twas contained within a perfumed and tinted envelope with a heavenly odor strong enough to do a hundred-yard dash in ten seconds flat. He wrote back, asking if the environment of living in Romeo was responsible. There's one town Billy's fighting shy of.

DOUBLY POPULAR NOW

And from North Carolina there was a letter saying his voice came to them clearly "mid the moonshine," and then went on to tell that the writer meant it literally, as he had the radio set rigged up just about ten yards or so from the family still, and that he took double stimulation from Billy's songs heard in his mountain home in such pleasant surroundings!

And so they run. Billy Jones was well known long before the radiophone came into common usage. But he is doubly popular now, and it is all due to his ability to stick to his field — comedy singing.

"The people want what they want when they want it," is his creed, "and most of the time they want popular, light songs that make them happy, not depressed."

When Ether Waves Run Wild

THE night was quiet, as nights usually are, unless they are noisy. And from out of the prune tree Gunga Din gently slid with his radio set tucked under his left arm, and he sang joyfully and softly in a high-pitched bass voice the latest of late hits, "Pay Me By Radio."

Gunga is a good old scout. His presence is a long-looked-for joy to every inmate of the county insane asylum and the folks who work in the pretzel bending factory just over the railroad tracks delight in having him hike out to the athletic field where they take their daily exercise to limber up and make them flexible and fit to bend pretzels.

Mrs. Din's little boy had caught the popular fever and nowhere did he go without his radio set. He read the newspapers, too, and scanned every radio item.

Among the items he read about the chap who believed he could hypnotize via radio especially interested him. What an opportunity! Just think how science has progressed. Why, nothing is impossible, thought he. That's Gunga, all over. For hours at a time he would sit and think. And then, of course, there were hours when he would only sit.

He cursed his luck with a "darn" and a couple of "goshes" when he read the announcement by an expert that big eared boys with red hair make the best radio operators. That forever barred him from becoming a shining light in the radio field, he cursed again and again. His ears were big all right, all right, but his hair was of the brilliant color one gets by mixing purple, orange, indigo and green. There was only one thing to do and that was to shave off his hair and then the gods who watched over the destinies of radio might be fooled.

On the night in question we find him slipping out of the prune tree. He had ben reading the thousands of prophecies and declarations made in the newspapers by earnest local reporters, who had been pulled off the job of writing obituaries and made Radio Editors. His head fairly swam and this alone brought him joy as he reflected that he had never learned to swim himself. What radio will do for one!

Why could not one get in touch with Mars or Venus or Jupiter by radio? If these other things were not impossibilities and the newspapers said they were not, why indeed could one not use the newly found wonders to plumb the depths of the unknown universe and find out all about the other planets? That was why we find Gunga near the prune tree. He had read somewhere that prune trees adapt themselves especially well to interplanetary communication, and that one needs only to wind the aerial around three and a half prunes of the 40-cent a pound size and then repeat the radio prayer "Alagazam, alagazam, oogi, oogi, blick" seven or four times to get the proper wavelength. This he did and as he slid down — for the third time — he sank upon the ground, put the receivers around his pear-shaped (beg pardon) prune-shaped head, and tuned in.

THE NEW HERO

—*N. Y. Globe*

At first he caught PDQ (Reno) and he listened impatiently to a few bars from the Pill Song from Carter, and the Powder Symphony from Colgate. He tuned again with slightly better luck and caught SOL (Zion City) and listened to a sermon on why the earth was flat. He was getting nearer to the edge, he exulted.

And then from far off there came a mass of sound, of swiftly moving jargon, which he knew positively did not have a place on this earth. At last! He, Gunga Din, had made the first inter-planetary communication! He waited eagerly until the noise subsided into a semblance of order. And then he heard a voice:

Voice: Hellohellohello.

Gunga: Whoisthis? Whoisthis? (He was excited and he let his words run together like an alley gang.)

Voice: This is Mars talking. Incidentally I might mention you are speaking to the smartest cockroach on our planet. Who are you?

Gunga: I'm Gunga Din on Earth.

Voice: Earth! At last! I thought down there you never would get hep to radio. We cockroaches of Mars have known about radio ever since the era of Kitchen Sinks.

Gunga: Cockroaches! You don't mean to tell me you are a cockroach!

Voice: I don't eh? Ask Howard Zimmerman of Harrisburg, Pa., what we cockroaches know about radio. Ask him.

Gunga: Yes, I read some place that he claimed cockroaches discovered radio or something, but tell me, do cockroaches live on Mars?

Voice: I'll say they do. All of Archite's forebears have tried in vain to get in touch with you, and we even sent some of our scout roaches to teach you how, but we wearied of your ever learning, until we caught your signal. Just a minute, I want to throw in a connection with Venus. I want to let them in on this.

There was a pause during which Gunga heard a buzzing noise and then he caught a second voice, a higher pitched one.

Voice: Say bug, this is a good one. Whom do you think I have on the radio?

Second Voice: Can't imagine.

And There's Humor in the Air

Voice: The Earth!

Second Voice: Well, I should light a summer's evening! Mercy, ho!

Voice: Gunga, are you still there—physically I mean of course. I want you to meet a great friend. Lightning bug of Venus meet Gunga Din of Earth.

Gunga: Lightning bug! Do you live on Venus. Why, we thought Venus was inhabited by men.

Second Voice: Men used to live here until they reached this more advanced stage. We, too, of Venus, despaired of your ever getting next to radio. At last you are, but I want to warn you that you owe it to the lightning bugs we sent down there. You can prove it by Hamilton Bailey, of Peoria, Ill. He knows.

Voice: Don't you believe him. Gunga, it was just as much our scout roaches as their bugs that taught radio.

Second Voice: Nonsense, Gunga, nothing doing. Don't you believe him.

Voice: I'll crawl all over your sink, you insignificent incandescent bulb.

Second Voice: Yes you will—not.

Voice: This is an insult. I shall call a meeting immediately of the Roachery, and we'll see if a war —

There was a mass of incoherent sound and the rest was lost on Gunga.

And Gunga was very thoughtful as he plucked a ripe prune. He munched it as he wended his way homeward.

Oh, very well.

The Wireless Widow

By George Mitchell

I've been a widow all my life;
That is, since I have been a wife,
Communing with myself, the time,
In solitary pantomime.

Golf claimed him almost every day,
And, as he niblicked on his way,
I followed in his gallery
Or, on the club house porch, drank tea.

At night, Bridge took him from my side;
I couldn't play it — though I tried;
But sat at home, with ill-content,
The while he gambled with the rent.

He gave up both. Said he: "I'm through,
I'll stay at home alone with you."
But Radio's got him. Fickle men!
And I'm a Widow once again.

—Judge.

A very wise plan
Has Dapper Dan—
His ten wives think
He's a wonderful man.

They're scattered throughout
A nation or so
But he keeps them all happy
By Radio.

Chorus: Oh, man, what a bee-u-tiful
theme!

PRACTICAL USE

YOUX!!
WOW!!
BOO HOO!!
MY GOODNESS —BABY'S AWAKE

HAVE A SENDING OUTFIT IN YOUR HOME AND PUT THE RADIO TO REAL PRACTICAL USE

—Savannah News

THE radio messages some think they are getting from Mars probably at that are as authentic, as someone recently remarked, as the messages Sir Arthur Conan Doyle gets from the dead and those former Secretary Tumulty gets from the living.

THE phrase "tuning in" has only one meaning to a young father, and it is not connected with radio. Any father will tell you that the Young Ones are the greatest little tuning coils on the market and they usually commence on the yellophone just when Dad feels like anything but walking the floor.

"Our Boy Has a Wireless"

By Mary Barton Smith

Our boy has made a wireless,
  I tell you I am glad,
The thing is done and all set up:
  For sometimes I got mad.
He talked about it all the time,
  morning, noon and night—
The dining room was upside down,
  The rug was out of sight.
There was saw-dust on the table
  And shavings on the floor,
I didn't get to sweep that room
  For three whole days or more.
He'd plane and hammer, saw and file,
  And scatter things about,
Then he'd make a break for school and—
  "Don't touch things", he'd shout.
He'd prowl around and fret and hunt
  For things he couldn't find.
And then he'd get a spool of wire
  And wind and wind and wind,
I think he wound a thousand miles—
  Of cause I can't be sure—
I know I held the spool for him
  Until my arms were sore.
He mussed up kettles, pots, and pans
  To melt the parafine;
He even got some in the grease,
  I had to cook things in.
He used up all of his dad's ink—
  He took a china cup—
To mix the mixins in he used,
  To stain the thing all up.
And when we put the aerial up
  I froze myself 'most blue,
But I had helped him all along
  And had to see it thru.
Some people passing in the street
  Wondered what it could be,
Professor Budin stopped and asked:
  "Is kitty up the tree?"
But now it's done and all set up
  And we can hardly think.
It's—"Hush! be still! I hear it buzz!
  It's Arlington I think".
Then dad, he looks at me and grins,—
  You know we dassn't talk—
And then we just float out the room,
  —You know we dassn't walk—
But now we're just plumb proud of him
  We don't care for the muss,
We want to keep him young in heart
  And always loving us.
I'll send a wireless each day
  To our great God above;
"O, always keep him sweet and pure
  Protect him with Thy love".

Gloversville (N.Y.) Herald

Thank Goodness!

"Contrary to the general impression there is little or no mystery about radio telegraphy or telephony—"Wireless—as it is commonly called."—*From a New Jersey newspaper.*

The Bell System In Radio

The Telephone Company's Position In Respect to Patent Agreements — Plans for Supplementary Phone Services and Public Broadcasting Facilities

By A. H. Griswold

RADIO today is a magic word throughout the country and, like anything else occupying headlines, much has been said of it, both good and bad, which it has not rightfully deserved.

What is radio? While it would probably take volumes to give a complete explanation of radio, yet perhaps it can be briefly explained in the following manner.

In the ordinary alternating current electric light and power circuit, such as are used to furnish light to homes and power to factories, the periodicity of the electrical current is almost universally sixty cycles per second. In other words, there are sixty complete reversals of the electrical current every second. At this low periodicity or frequency practically all of the electrical energy is confined to the wire system and none of it radiated into space. However, by sufficiently increasing the frequency or period of oscillation of an electrical circuit and by suitable circuit arrangements a large proportion of the electrical energy generated may be radiated into space as electro-magnetic waves. These electro-magnetic waves travel through space with the speed of light and have frequencies varying from around 15,000 to several million cycles per second.

In order to transmit a telephone message by radio the amplitude of the high frequency waves sent out is made to vary in accordance with the variation of current produced by the voice in an ordinary telephone circuit. The problem of producing these high frequency electrical waves and of thus controlling them by telephone currents has been solved in a satisfactory manner only by means of the three-electrode vacuum tube.

During our development of the vacuum tube in connection with the telephone repeater, we found that it was possible to make larger and more powerful tubes which could be used for radio telephony, and it was this development that brought about the memorable and remarkable experiments of 1915, when we talked by radio to Paris, San Francisco and Honolulu. Subsequently the laboratories of the Bell System have diligently continued their development and research work, until today the fundamentals of radio telephone communication are fairly well established, and the kind of equipment necessary is generally known, although it has not been commercially produced except for such real uses as have been found in the field of telephone communication.

At the same time development by others of radio and allied equipment was taking place and, as might be expected, it was not long before it was found that the patent situation was considerably involved and that the public would be unable to obtain the full benefits of radio unless some arrangement could be made between the holders of the patent rights which would permit of unhampered development. Accordingly, at the request of the United States Government, the General Electric Company and the American Telephone and Telegraph Company entered into a cross-license patent agreement, effective as of July 1, 1920. In general, by this agreement, the American Telephone and Telegraph Company received licenses in the field of commercial and public service radio telephony, while the General Electric Company received licenses in the field of amateur radio telephony and all radio telegraphy.

Following the execution of the principal agreement between the American Telephone and Telegraph Company and the General Electric Company an extension agreement was entered into whereby the General Electric Company may extend to the Radio Corporation of America any of the licenses which the General Electric Company received under the principal agreement, and likewise the American Telephone and Telegraph Company may extend to the Western Electric Company any of the licenses which the American Telephone and Telegraph Company received under the principal agreement. Subsequently, the Westinghouse Electric and Manufacturing Company, who also had been at work in the radio field, entered into the agreement in the same patent license fields as the General Electric Company and Radio Corporation of America.

A. H. Griswold, author of this article and Asst. Vice-President of the American Telephone and Telegraph Company

Prior to all this, the Radio Corporation of America had been formed, had taken over the interests of the Marconi Company in the United States and had entered into an agreement with the General Electric Company whereby it acquired rights to use and sell all radio equipment which the General Electric Company was licensed to manufacture.

The situation today, therefore, is as follows:

In general, radio telephone equipment for commercial or public service uses is provided by the American Telephone and Telegraph Company or through its manufacturer, the Western Electric Company. Amateur radio telephone equipment, radio telephone broadcasting receiving sets, and radio telegraph equipment are manufactured by the General Electric Company and Westinghouse Company and are sold through the Radio Corporation. The underlying principle throughout this cross-licensing agreement is to insure and make available to the public the complete development of radio.

RADIO TELEPHONY A SUPPLEMENT TO AND NOT A SUBSTITUTE FOR WIRE SERVICE

The interest of the Bell System in radio lies in whatever application it may have to the possible future development of telephone services. In the Bell System or any other system based on sound economic principles, the fundamental consideration in any communication problem is the provision of the type of facilities which will give the best and most economical service to meet the particular set of conditions involved. In this there is made no distinction between wires and radio, as the premise is the proper type of communication and the conclusion may be wires or radio. However, it happens that the inherent features of radio telephony are such that it has no economic or service application in the United States, or in any other place where conditions are similar, except as a supplement or auxiliary, in certain instances, to the wire service, but in no case a substitute therefor.

The real applications of radio are in communications across wide stretches of water, in ship to ship, in ship to shore, in airships to land, in possibly some other types of mobile stations, in some forms of broadcasting where the same communication is given simultaneously to a large number of people, and in remote cases where, due to geographical or other conditions, it is impossible or impracticable to place wire lines. All of these applications will be recognized as supplements to the regular wire service and not substitutes for them. For the regular telephone service both local and long distance, for which wires are now so extensively employed in the United States, the limitations of radio are such that it cannot be used.

Radio Telephony Can Never Replace Universal Wire Sebvice

The general telephone communication goal in the United States is universal service. This is merely a brief way of saying that any person, anywhere, at any time, can quickly, reliably and at a reasonable cost, talk with any other person anywhere else in the United States, and for this talk these two persons will have available facilities for their personal, private and uninterrupted use. Radio does not meet these requirements. It provides unguided transmission, sending out its message broadcast to anyone within range properly equipped to receive it, while wires, although they came first in scientific development, really represent the refinement of the art and provide guided thansmission directed only to the person for whom intended. Scientifically it is actually more remarkable that we are able to guide messages by means of wires than to send them out broadcast by radio.

The number of communications which can be transmitted simultaneously by radio is narrowly limited. Daily over 60,000,000 telephone calls take place over wires in the United States. In New York City 4,000,000 calls are handled per day and 100,000 calls per minute during the busy hours. The facilities of the ether within any reasonable practical range are so limited that but a very small fractional part of such an enormous volume of messages could be handled by radio. Further, the real applications of radio as hereinbefore outlined will undoubtedly demand greater facilities than the ether will afford and it is certainly desirable that the ether be conserved for such real and necessary uses. If this is not done, it will be almost hopeless to expect that satisfactory service can be given even in the real fields of radio.

The cost of radio equipment and operation for universal service would be enormous. The investment of the Bell System in the United States today is less than $200 per subscriber's station, including both local and long distance lines, and comprehending all the poles, wires, cable, conduit, equipment, land, buildings and accessories of the entire system. It is impossible to conceive at any cost any form of radio equipment which would provide the same universal telephone service.

However, suppose an attempt were made to set up such a radio service. It can be imagined to be along either of two lines: First, the apparatus at each subscriber's premises might be kept as simple as possible, and arranged only to connect that subscriber to a central office in a manner similar to that by which each subscriber is now connected by wire. Second, by making the subscriber's apparatus more complicated, the subscriber might be given apparatus enabling him to directly connect with other stations in his vicinity, and he would reach more distant subscribers by connecting to a central office. It is impossible to imagine any arrangement so comprehensive as to enable him to directly reach all other subscribers.

In the first case his apparatus would consist of both transmitting and receiving equipment with suitable signaling and power apparatus and with some form of antenna. It would need to be much more complete and reliable than any of the present simple forms of amateur equipment. In this case the radio equipment would merely take the place of the wire connection between the subscriber and the central office, but the cost of the radio equipment would be much greater than the total cost per subscriber of the entire existing telephone wire plant. In addition central offices and trunks, involving very expensive and elaborate radio apparatus, would be required to complete the connections.

On the second assumption, part of the central office expenditures would be avoided, but the cost of the apparatus at each subscriber's station would run into thousands of dollars, and in addition a considerable part of the central office expenditures would still be necessary.

For long distance service radio has a more favorable application than it has for local service, but again it is found here that both in first cost and subsequent cost of operation it is many times more expensive than for wire circuits and does not approach them in reliability or freedom from interference and is not secret.

Thus the cost of a complete radio plant for either local or long distance service or both is far in excess of the corresponding wire plant, and not only is the first cost of radio equipment greater than for wire equipment, but the experience to date indicates that the cost of operation of radio is greater per dollar of investment than for wire plant. This means that radio telephone service, even if it were possible, must have rates, in order to pay the costs of operation, many times greater than charged for the present wire service.

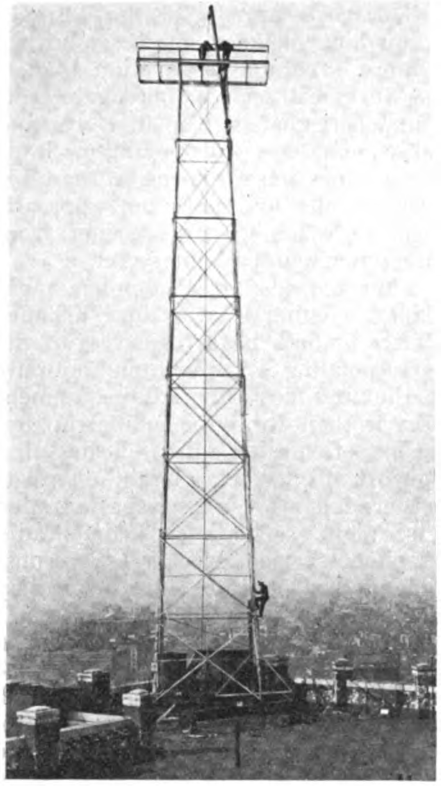
From the above it is evident that the cost of radio service would be excessive and that the character of the very limited service which could be given by radio would be so far inferior to the service now given over wires that the general public, even if they could afford to pay for it, would not tolerate it.

The words of the Secretary of Commerce, Mr. Hoover, at the recent Radio Conference in Washington, are interesting and to the point:

"I think it will be agreed at the outset that the use of the radio telephone for communication between single individuals as in the case of the ordinary telephone is a perfectly hopeless notion."

Some Present Applications of Radio Telephony

Let us then consider some of the applications of radio telephony which in the present state of the art can now be foreseen. Between moving vehicles, ships, ships and shore, airships and ground, and similar classes of services, radio telephony has an application. All of these are possible fields, and as time goes on, it may be expected that they will be developed into useful auxiliaries to the wire service. Recently interesting and successful experiments on ship to shore transmission were conducted with the United States Steamship *America,* operating by radio in connection with our Deal Beach radio station and thence over land wires to New York and other points. These tests showed that ship to shore service is possible, but whether or not it is established as a commercial service must necessarily depend upon its value, which must be great enough to make the service self-sustaining.



As the towers neared completion in the establishment of the New York broadcasting station of the Bell system

Trans-oceanic wireless telephony is, of course, possible, as was demonstrated by us in 1915. However, the present costs are very great and before it can be generally employed, the commercial value, as in the case of ship to shore, will have to be determined and assured. A factor operating seriously against such service is the great difference in time between countries located widely apart.

BROADCASTING

One of the most interesting applications of radio telephony is that of broadcasting, which is not intercommunication but a one-way service. It is in this field that radio, by virtue of its inherent nature, seems to have great possibilities. At the present time broadcasting is being done by various departments of the Government, by certain manufacturers or agents of radio apparatus, by experimenters, by newspapers, and until recently by amateurs. The existing broadcasting transmitting stations are operating in the particular interest of the owners of such stations and are not providing broadcasting transmitting service for the use of the public in general. The American Telephone and Telegraph Company controls the important patents on radio telephone broadcasting transmitting equipment for general public use and consequently is being besieged with requests to sell radio telephone broadcasting equipment or to provide radio telephone broadcasting service. We are selling the broadcasting equipment and so many of these requests have been received that it has become apparent that if every one who desires his own broadcasting equipment should purchase it, there will soon be so many broadcasting stations all operating on the same or a comparatively few number of wavelengths that real service from any of them will be impossible. Accordingly, we are now establishing in New York on the Walker-Lispenard building a broadcasting station of the latest and best type known to the art. It is not planned that we put on any program ourselves but rather provide the facilities over which others may broadcast at specified rates. We could doubtless provide and broadcast a splendid program, but by such a procedure we would be inviting the public to purchase receiving equipment in order to hear our program and we would be committed to the indefinite continuance of a service for which no revenues would be received. By providing facilities for the use of others it rests with those who broadcast to furnish a class of program to which the general public will desire to listen. It is thought that in this manner the true attitude of the public toward broadcasting may be determined, as it is realized that at present the public is in a more or less optimistic state of mind and that broadcasting must be placed on a much more sound basis if it is to remain as a valuable service.

If the experimental broadcasting station in New York is commercially successful, it is our plan to establish, as circumstances warrant, similar stations throughout the country, and not only may each station have available for use in connection with it all of the local lines in the zone served by that station but also at some future time it may be possible that all of such broadcasting stations throughout the country may, if conditions warrant, be tied together by the long line plant, so that any one, from practically any point, may use any number or all of these stations simultaneously if he so desires. It is our thought that only in this manner can the best, cheapest, and most extensive radio broadcasting service be given.

It should be understood that this service will not react to the exclusion of private or other broadcasting service and will not necessarily in any way directly displace such services. However, it is obvious that every one cannot own his own broadcasting equipment, and unless some provision for service such as we have outlined is made, only a limited number of people in the country will have broadcasting service available for their use.

PRESENT LAWS AND PROPOSED REGULATIONS

The present radio laws, which were made originally in 1905 and later modified in 1912 and adopted by Congress, cover principally the international situation with reference to radio telegraphy, as radio telephone service was not practicable at that time. With the rapid development of radio telephony, particularly since the war, there has been a strong realization that the present radio laws are entirely inadequate for the present situation and not only is the international communication question now under consideration but also the national problem. During February the Secretary of Commerce appointed a committee to consider radio telephone matters. This committee first met on February 27 and has been carefully considering the requirements for radio telephony with the idea through subsequent legislation, of providing space in the ether for the necessary and real services. It is proposed in the preliminary report of the Secretary's Committee that a large part of the available space in the ether be set aside for various kinds of broadcasting, with a small reservation

The Captain of the Steamship America talking to persons on shore, at their homes and offices in radio tests that proved ship-to-shore service practicable for ship to shore, for trans-oceanic and for fixed station service. The temporary assignments which the committee have suggested for the desirable uses of radio are naturally limited by the ether and by the character of practical apparatus so that no one of the services will probably receive as full an allotment as might be desired.

It is hoped that the proposed legislation will provide reservations in the ether for what now seems to be the possible applications of radio telephony to the public service in order that these applications may have an opportunity for development along proper lines. It is also desirable that there be established and maintained a rigid regulation of radio matters with the end in view that prime consideration will always be given to the necessary and essential uses of radio.

While we have important exclusive rights protected by patents, our interest in the extension of our field of service overshadows any interest in any patent or group of patents. Above all, we do not want to obstruct the work or play of scientists and amateurs. Progress follows experiment and use. In this new art we should experiment and encourage the experiments of others, but without prejudice to later enforcement of our rights if and when such enforcement becomes necessary to the efficiency of a public service.

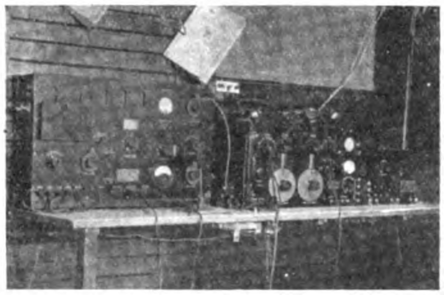
The question of most interest in the Bell System is naturally—"What do we propose to do with radio?" We propose to keep in mind our main purpose which is to furnish to the people of the United States as wide a range of communication facilities as possible. It may mean service with ships, railway trains and airplanes. It may mean a trans-Atlantic service, but promises cannot now be made. It may mean broadcasting, the future of which cannot be determined as yet. It should be remembered that radio telephony, with its scope definitely limited by natural conditions, has only reach an elementary stage, even in its possible fields. Bearing in mind our fundamental policy of providing the best and most economical type of facilities to meet any given set of conditions, we shall continue our work of developing whatever possibilities there are for radio in the field of telephone communications.

Radio Communication Between Life Boat and Shore

By S. R. Winters

EXPERIMENTS in the use of the radio-telephone as an agency in maintaining rapid communication between a motor life-saving boat and a station on shore have recently proved successful. The experiments were conducted jointly by the Radio Communication Section of the National Bureau of Standards and the United States Coast Guard Service, the latter contemplating the application of radio-telephony as a life-saving device at several of its coast-guard stations.

The coast guard boat on way out to sea to make tests



Transmitting and receiving equipment used in the tests

Radiophone installation on U.S. Coast Guard life boat

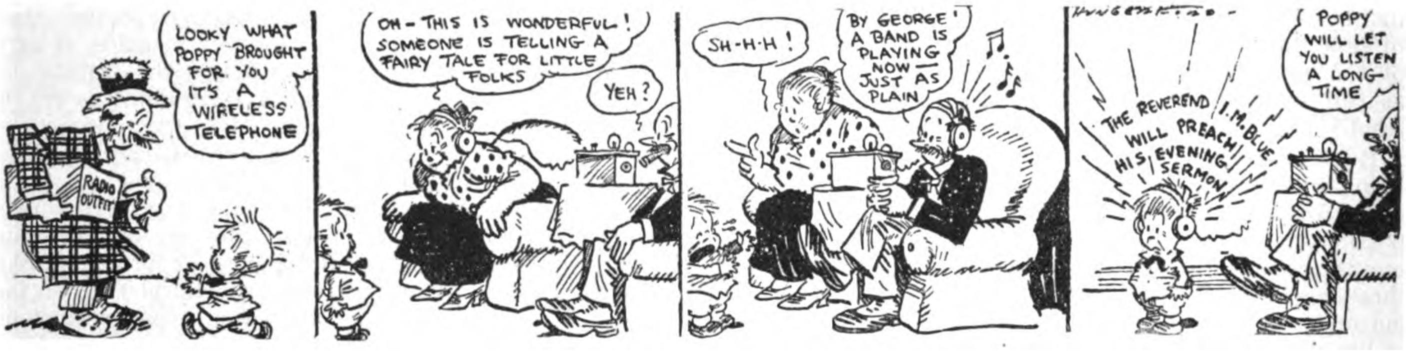
Seafaring vessels are most frequently wrecked in stormy weather and the rescuing crew necessarily have to perform its services quickly and without encumbrances on the life-saving boat. Dangling wires or the towering antenna common to the conventional wireless transmitting and receiving outfits obviously could not be used. Therefore, the coil antenna, by reason of its compactness and nonrequirement of insulation from the earth, was selected as the form of apparatus for conducting the novel experiments.

Two vertical pipes grounded at each end and having a connection made across their upper ends proved a satisfactory arrangement. A coil antenna previously developed for use on submarines, offered a sort of model for the design installed on the motor lifeboat. The boat subjected to the unusual observation-tests was thirty-six feet long, propelled by a gasoline engine, and was equipped with a substantial metal keel. The receiving and transmitting wireless outfit was installed as far forward on the motorboat as possible and from the apparatus was extended forward a wire which was connected to the keel. Two other wires, heavily insulated, were run aft along the guards and welded to the keel. Thus, it is seen, a particular design of coil antenna was shaped, of which the keel was an integral part.

The transmitting outfit employed on the boat and the one at the station on shore were in agreement as to design and capacity. The unit consisted of a 5-watt radio-telephone and a receiving set. The wavelength selected for transmission from the boat was 380 meters; from shore 675 meters. The receiving outfit included three stages of radio-frequency and two-stages of audio-frequency amplification. The transmitter proved powerful enough to maintain effective communication with the land station when the boat had sailed six miles from shore. This distance is adequate to the usual demands of the life-saving service and the tests proved eminently satisfactory.

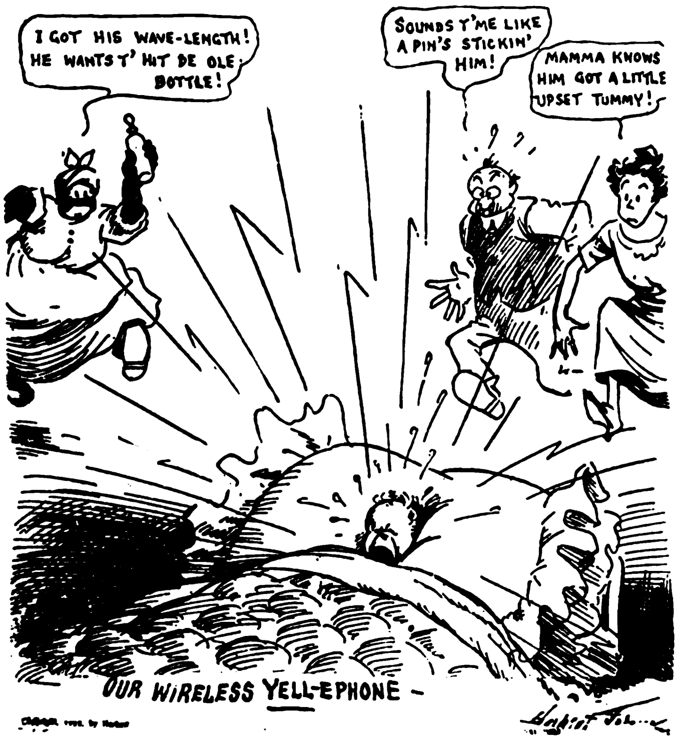
The Popularity of Radio Is Providing Cartoonists

LISTENING IN


LOOKY WHAT POPPY BROUGHT FOR YOU IT'S A WIRELESS TELEPHONE
RADIO OUTFIT
OH — THIS IS WONDERFUL! SOMEONE IS TELLING A FAIRY TALE FOR LITTLE FOLKS
YEH?
SH-H-H!
BY GEORGE! A BAND IS PLAYING NOW — JUST AS PLAIN
THE REVEREND I. M. BLUE WILL PREACH HIS EVENING SERMON
POPPY WILL LET YOU LISTEN A LONG TIME

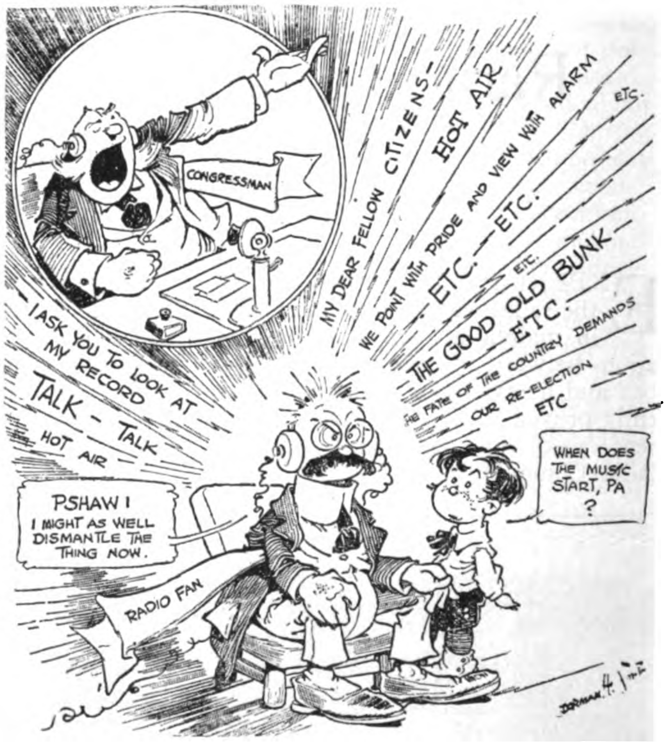
—*Hungerford in Peoria Journal*

THE ORIGINAL BROADCASTING STATION


I GOT HIS WAVE-LENGTH! HE WANTS T' HIT DE OLE BOTTLE!
SOUNDS T'ME LIKE A PIN'S STICKIN' HIM!
MAMMA KNOWS HIM GOT A LITTLE UPSET TUMMY!
OUR WIRELESS YELL-EPHONE —

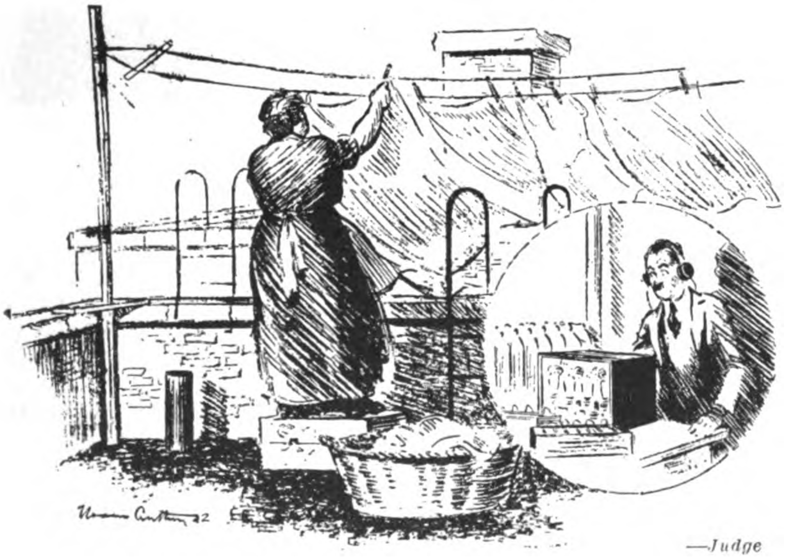
—*Johnson in Des Moines Capital*

"ANOTHER GOOD THING GONE WRONG"


CONGRESSMAN
MY DEAR FELLOW CITIZENS — HOT AIR
WE POINT WITH PRIDE AND VIEW WITH ALARM ETC.
ETC. — ETC.
THE GOOD OLD BUNK — ETC.
ETC.
THE FATE OF THE COUNTRY DEMANDS OUR RE-ELECTION — ETC
I ASK YOU TO LOOK AT MY RECORD
TALK — TALK
HOT AIR
PSHAW! I MIGHT AS WELL DISMANTLE THE THING NOW.
WHEN DOES THE MUSIC START, PA ?
RADIO FAN

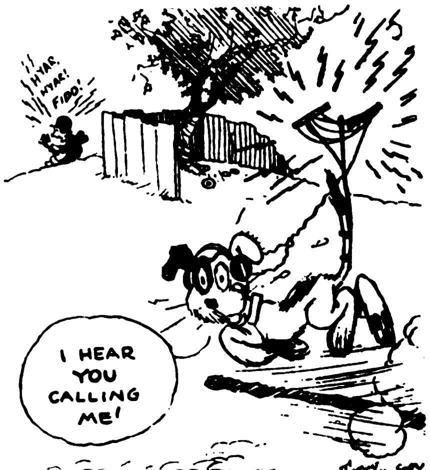
—*Smith in Atlantic City Gazette*

"A BUSY WIRE"



—*Judge*

FOR PEOPLE WHO CAN'T WHISTLE


HYAR! HYAR! FIDO!
I HEAR YOU CALLING ME!

—*N. Y. Globe*

With Ammunition For Their Oscillating Penpoints

THRILL THAT COMES ONCE IN A LIFETIME

I TRIED T' GIT A BETTER RANGE BY PUTTIN' A 43 PLATE VARIABLE CONDENSER IN MY GROUND CIRCUIT YA CAN INCREASE TH' WAVE LENGTH RANGE OF 'IH' CIRCUIT BY CONNECTIN' TH' CONDENSER ACROSS TH' PRIMARY
I WROTE AN' AST IF A LOOSE COUPLER AN' 2 HONEYCOMB COILS USED IN PLACE OF VARIOMETERS WOULD BE AS GOOD AS TH' STANDARD HONEY COIL SET. THEY TOLD ME THAT A SMALL CONDENSER SHUNTIN' TH' SECONDARY OF TH' COUPLER AN' TH' GRID COIL WOULD GIMME AS GOOD RESULTS AS TH' STANDARD HONEYCOMB COIL SETS.
HOW'D JA LIKE TH' CONCERT W J Z PUT OUT YESTERDAY?
THE OWNERS OF RADIO PHONES SPRING SOME TECHNICAL STUFF FOR THE BENEFIT OF THE LAYMAN
GENTEK

—*Webster in Sioux City Journal*

HOW MOTHER GOOSE MIGHT HAVE BEEN WRITTEN

THERE WAS AN OLD WOMAN WHO LIVED IN A SHOE.
SHE HAD A FLOCK OF CHILDREN AND KNEW JUST WHAT TO DO-
FOR SHE DIDN'T WHIP THEM, NOR SEND THEM TO BED;
SHE STRAPPED A RECEIVER ON EACH LITTLE HEAD.
OH, PRUDENCE. COM'ON AN HEAR T' BAND PLAY!
TELL TH' GANG TO HURRY! LISTENIN' IN!!
HURRY! JIMMINY CRICKETS!
NOW CHILDREN IF YOU'RE GOOD TONIGHT WE'LL LISTEN IN ON K.D.K.
WISHT WE'D HEAR S'MORE FUNNY JOKES TONIGHT!
W.J.Z. TO NIGHT

—*N. Y. Globe*

OUR OWN RADIO RAVINGS

WAVE LENGTH ZKXTMVOBLAA

A FRIEND DROPS IN AND THE FAMILY MAKES HIM SIT DOWN AND LISTEN TO A HUMOROUS MONOLOGUE, DELIVERED BY PHILIP J. MUMBLEVOICE FIVE HUNDRED MILES AWAY.

DAD SAID HE BOUGHT THAT RADIO OUTFIT FOR ME AND HE HASN'T LET ME LISTEN TO IT ONCE
I'M SORRY WE HAVE ONLY ONE RECEIVER ON THE MACHINE-I'LL BET IT'S A SCREAM
ERK ERK BLAA BLAA AND I SAID TO HIM BLUK UMP CLICK
SOUNDS LIKE SOMEBODY FRYING EGGS
M. GOLDBERG

—*Dallas Journal*

JEFF KNOWS THEM ALL

SIR SIDNEY GAVE LITTLE CICERO THIS EXPENSIVE RADIO OUTFIT BUT I CAN'T GET IT TO WORK. IF I KEEP ON FOOLING WITH IT I'LL PROBABLY RUIN IT!
I'LL TAKE IT TO AN ELECTRICIAN! I WISH I KNEW OF A GOOD ONE!
GOOD MORNING, MUTT OLD DEAR!
CHEERIO! JEFF, DO YOU KNOW A GOOD ELECTRICIAN?
DO I KNOW A GOOD ELECTRICIAN! I'LL SAY I DO!
WHAT'S HIS NAME?
KID EDISON!
?
Fisher

—*Birmingham News*

What Newspaper Editors Say

Press of the Country, Reflecting Public Attitude Declare for the "Era of the Radio"

THAT the public still is greatly mystified and highly interested in the sudden popularity of the radiophone is reflected in the press of the country. Minds which are not held down to the technical limitations of wireless have soared to undreamed of heights with the first taste of the new form of communication. Thus we find the *Wheeling (W. Va.) News* saying that the statement of a high telephone official that the field of radio is limited "will not hold."

"At the present time," the newspaper says, "there is no doubt that the situation looks that way. But to us, unfamiliar as we are with the scientific details of wireless, it would appear an easier task to make this field unlimited, than it was to bring radio to the surface in the first place.

"Just now there is hardly a chance of radio supplanting telephone and telegraph wires, but at one time the steamboat was never thought to be a practical means of transportation; the automobile was nothing but a toy and the airplane would never be made safe. Scientific minds are bound to improve radio. The statement of the official will not hold."

The *Temple (Texas) Telegram* calls this "The Era of the Radio," and adds that the "possibilities of radio in achieving many improvements and creating many new advantages in the every-day affairs of men are developing so rapidly that the mind scarcely has time to grasp the scope and application of one phase of radio activity before a newer and more startling announcement of its possibilities is proclaimed to the world."

"Broadcasting speeches, music and entertainments has been demonstrated as practicable and economical."

The newspaper adds:

"Among the latest announcements of the utilization of radio communication is the proposal of a great trans-continental railroad system to install radio phones on its Pacific coast through trains by means of which its passengers will be enabled to keep in direct communication with their business or social affairs without interrupting their travels. Tests now being made by radio companies will determine whether this installation on fast moving passenger trains is practicable.

EDUCATION VIA RADIO

"Of greater moment, however, is the announcement from New York, that with further development of radio service it will be possible to acquire a complete college education at one's home without the expense and incidental temptations for the student actually going to a university. One institution in New York, of national fame, has announced that a broadcasting station will be established in Washington Square in Greater New York through the instrumentality of which classes in all its university courses will be conducted.

"With such developments as these so early in the practical application of the radio wireless service the mind is staggered in contemplation of the marvels that seem sure to follow. It is to be accepted that there will be equal additional development in this line of scientific research as there has been in the field of practical electrical appliances, which means that the world is just at the threshold of the wonders of the radio."

Many newspapers are calling the interest by the public a "fad" or a "craze." Thus we find the *Oshkosh (Wisc.) Northwestern* referring to it as "the latest popular craze" and adding that the rapid spread of "this fad has caused experts to predict and foresee in this new method of communication the possibilities of important and far-reaching changes that will affect various phases of business and social life."

MAY ADDRESS MILLIONS

"It is suggested that this offers an opportunity for a new kind of political campaigning. Instead of speaking to a few hundreds, or thousands, a campaign orator will be able to address a radio audience of many thousands, or even millions, at one time, and scattered over a wide area. In fact, there are so many strange possibilities connected with this new device for utilizing the mysterious ether waves that one wonders where it will lead to."

Many of the accomplishments of wireless are so marvelous to the non-technical mind that they liken the results to wizardry. The *Worcester (Mass.) Post* heads an editorial "Wireless and Wizardy," and in speaking of radio communication between a flying airplane and racing auto, it declares that radio is "man's greatest conquerer of space and location." And the *Austin (Texas) American* thinks that times will "be so changed, with so many now unthought-of marvels, that the people of 1942 will yawn at us, just as we look bored when an old soldier reminisces."

A bare announcement recently that talking movies through the use of radio, had been successfully demonstrated in Chicago immediately caused many editorial minds to leap into the realm of speculation. We thus find the *Shamokin (Pa.) News* declaring solemnly that "it is not straining the imagination to picture a day when moving pictures themselves will be broadcasted into homes by wireless, the same as a photograph now can be cabled across the ocean."

Newspapers, too, are enthusiastic about the possibilities of transmitting news by radio and thus increase the prestige of their respective dailies. Says the *Los Angeles (Cal.) Herald* editorially:

"The latest news of the city and the world, available by merely taking down a telephone receiver—this would seem to be the acme of comfort in the pursuit of daily information. But this is what is being made available to people within a radius of 2,200 miles daily, through the enterprise of *The Evening Herald* in its new radiophone news service.

"And you do not even have to be a subscriber, although you do have to put up your own radio receivers; but the news service is absolutely free. From information received it is already proving a boon to ships at sea, to those isolated on Pacific islands and to people in out-of-the-way places west of the Rocky mountains. Indeed, many hotels in small towns remote from large city newspapers are installing receiving apparatus in order to keep their guests informed on the latest doings in the great world around them.

"This service is rendered every day except Sunday, at 5 o'clock in the afternoon, which means that the news of Europe up to midnight and of the East up to 8 or 9 o'clock is covered and announced 'before it happens'—because of the difference in time."

And finally we see the press widely awake to the extreme importance of radio and soundly criticizing public officials who may or may not be negligent about the installation of radio equipment on vehicles of water transportation.

LAW NEEDS AMENDMENT

"Radio has saved thousands of lives on the sea," says the *New York Evening Mail.* "In 1902 the S. S. Philadelphia was provided with radio for emergency. In 1912 a law was passed that made it necessary for ocean-going vessels to carry a radio station.

"Recently a seaplane set out from Miami, Fla., to Bimini. It carried seven persons. The plane developed trouble en route as planes often do, and it had to alight upon troubled waters. In a few hours it was at the mercy of a restless sea.

"What happened to its wireless apparatus? It did not have any! If it had been provided with a low-power transmitter, all of the passengers would have been saved. A few SOS signals would have brought plenty of assistance.

"Does Mr. Hoover know that seaplanes are allowed to carry passengers over forty miles of watery waste without a radio outfit? If he does, let us hope that he will act to prevent further loss of life. Our radio law needs an amendment that will force the owners of seaplanes carrying passengers to install a radio outfit. It is the only assurance of safety these crafts can offer when they are drifting helplessly on the bosom of a mad sea."

WORLD WIDE WIRELESS

Radio Telephone Conference Report

THE Radio Telephone Conference, called some time ago by Secretary of Commerce Hoover to help solve the present chaos in the air, rendered its final report, on April 27.

"It is recommended," says the report, "that the wave band assigned to amateurs, 150 to 275 meters, be divided into bands according to the method of transmission, damped wave stations being assigned the band of lowest wavelengths, interrupted or modulated continuous wave radio telegraph stations the next band, radio telephone stations the next band, and, finally, unmodulated continuous radio telegraph stations the band of highest wavelengths. It is recommended that amateurs be permitted to carry on broadcasting within the wavelength assigned by the Secretary of Commerce to amateur radio telephony."

Recommendations are made that the Secretary of Commerce assign to each radio telephone broadcasting station a power range of 600 land miles for Government stations, 250 miles for public broadcasting stations, and fifty miles for private and toll broadcasting stations; that the same wave band or overlapping wave bands should not be assigned to stations within these distances of each other: Government, 1,500 miles; public, 750 miles, and private and toll, 150 miles.

The conference adopted at its final meetings a new provision recommending that the operation of Government stations be conducted in such a manner as not to interfere with commercial traffic and broadcasting.

The report recommends the appointment by the President of an advisory committee to the Secretary of Commerce to consist of twelve members, half of whom shall be from the Government and half from civil life.

The general allocation of wavelengths provides: Trans-oceanic service, 6,000 meters; fixed radio telephony, non-exclusive, 3,300; mobile service, non-exclusive, 2,650; Government broadcasting, 2,050; aircraft, 1,550; city and State public safety broadcasting, exclusive, 285; amateur, 275.

New Swiss Radio Station

A HIGH-POWERED, loud-speaking wireless telephone station is being installed at Lausanne, Switzerland, by means of which it is planned to hold daily communication with the Eiffel Tower in Paris. The apparatus will be capable of receiving messages from London, Berlin, United States and airplanes flying over Western Europe.

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Maj.-Gen. George O. Squier using electric lamp socket to receive radiophone broadcasting

Annual Report of the Radio Corporation

THE trans-Atlantic circuits of the Radio Corporation of America are now carrying 20 per cent. of the messages between this country and Europe, according to the annual report of the corporation.

Out of a gross income of $4,160,844 in 1921 the corporation made a net profit of $426,799. This amount was applied against reserves for depreciation of patents, which the directors believe inadequate.

The year 1921 was largely devoted to increasing the efficiency and capacity of existing communication channels and to extending, through present European correspondents, connections with othe rcountries by wire telegraph. Thus there has been provided indirect service to almost the entire world, except South Ameriac.

Six direct international radio communication circuits are now in operation by the Radio Corporation of America: Great Britain, opened March 1, 1920; Norway, opened May 17, 1920; Germany, two circuits, the first opened August 1, 1920, and the second May 19, 1921; France, opened December 14, 1920; Hawaii and Japan, opened March 1, 1920.

The installation of high-power stations in South America has been inaugurated, by joint arrangement with the French, German and English companies, under which the interests of the four companies are trusteed, with an American chairman chosen by the Radio Corporation of America. A station is now being erected in Argentine, and a concession has been obtained and financial commitments made in Brazil. At Warsaw, Poland, the Radio Corporation of America is now erecting a high-power station. One-half of the necessary radio equipment has been forwarded to Poland from the United States, and American engineers are making the installations.

The new receiving station for trans-Atlantic radiograms is at Riverhead, L. I., where the one antenna consists of two copper wires nine miles long strung on telephone poles, and receives simultaneously messages from Norway, England, France and Germany.

The erection of radio telephone broadcasting stations in various parts of the United States has resulted in a great demand for radio telephone receiving apparatus. The demand came up overnight and apparatus embodying the latest improvements and of a character suited for general use has now been developed for manufacture in large quantities, and it is believed by the officers of the corporation that the demand, large though it may be, will soon be filled.

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S.S. Iowa Radio Tests Postponed

THE proposed gunnery tests of the Atlantic fleet, with the wireless controlled U. S. S. Iowa as the target, scheduled for May 1, have been postponed indefinitely in order to effect fuel economy, the Navy Department has announced.

Development of Radiotelegraphy in Czecho-Slovakia

FOR some time, the Ministry of Post and Telegraph of Czecho-Slovakia has been planning to build a central wireless station, with subsidiary stations in different parts of the Republic. With this end in view, the Ministry has carefully followed all inventions in the field of radiotelegraphy and has sent its engineers to foreign countries for the purpose of studying wireless systems already in operation.

A station will be built at Podebrady, Bohemia, equipped with high-frequency generators(Letour-Bethenod type), producing 50 kilowatts of energy at the antenna. The entire station with two towers, 500 feet high, will be capable of generating additional energy up to 100 kilowatts at the antenna. When the need warrants the expansion, another generator developing 50 kilowatts of energy will be installed. The radius of transmission will be about 2,500 miles.

The Podebrady station will also be the main sending station for Prague, and wireless telegrams filed at Prague will be transmitted by it. In addition to the main station, the State Post and Telegraph office at Podebrady is building a smaller station, equipped with vacuum tubes.

At Kral Vinohrady (a district of Prague) a wireless station with a radius of 250 miles is operated in connection with the Main Post and Telegraph office. At Brno (Brunn), Moravia, a radio plant has been constructed recently with a range of 600 to 900 miles. Tests of the apparatus and service between these two stations were made at the end of January and proved entirely successful. Further tests are now being made between Brno and radio stations in other European countries.

For radio communication between Slovakia and Prague, as well as with the Orient, a new station is being erected at Kosice, Slovakia, while still another at Bratislava will be operated for the benefit of the shipping on the Danube and for the International Danube Commission, now sitting at Bratislava.

A radio sending and receiving station has been projected for Liberec (Reichenberg), and the authorities state that they hope to have it completed before the opening of the Third International Sample Fair, which will be held in that city from August 12 to 20 of this year. The State Telegraph office at Karlovy Vary (Carlsbad) also desires to establish a small radio station at that point before the season opens at the baths.

Because of the importance of radio communication to aerial navigation, the Czecho-Slovak Ministry of Post and Telegraph and the Ministry of National Defense are now building a wireless station with a range of 600 miles at the Kbely (near Prague) aerodrome, the starting point of aeroplanes for Paris and Warsaw. In Western Bohemia, at Plzen, or Cheb, a station will be established in connection with the air service to Paris and another in northeastern Bohemia, with that to Warsaw. The Prague, Brno, Bratislava, and Kosice wireless stations will also serve the air fleet. In addition to these joint plans a Ministry of National Defence is proposing to build its own wireless stations for military purposes.

Bankers and industrial concerns in Czecho-Slovakia confidently expect, in a very short time, to be receiving information by wireless from the Bourses of London, Paris, Berlin, Zurich, Amsterdam, and New York.—*By C. S. Winans, American Consul, Prague, Czecho-Slovakia.*

◆ ◆ ◆

Ban on Political Speeches From Government Stations

UNTIL a definite policy has been established by the Government regarding the use of naval radio telephone equipment for broadcasting, no further political speeches or lectures will be sent out. This decision of Mr. Denby to curb the general use of naval equipment followed an investigation into the use of broadcasting stations by members of Congress for addressing their constituents.

Democratic members declared that the use of Government radio facilities had been granted only to Republicans, and the Secretary of the Navy, determined to put an end to the growing confusion pending the determination of a definite policy by this body.

◆ ◆ ◆

Navy Radio Bill Signed By President Harding

THE bill extending use of the Government's naval radio facilities for commercial and press purposes until June 30, 1927, has been signed by President Harding.

As passed by the House the measure authorized the extension of the use of such facilities only until next June 30. The Senate amended it by making the extension until June 30, 1927. The compromise does not apply to messages to China.

◆ ◆ ◆

Music from Schenectady to San Francisco By Radio

SAN FRANCISCO has listened to spoken words and instrumental music played in New York State carried by radiophone over more than 3,000 miles.

For more than four hours the music and conversation transmitted on the Atlantic Coast was checked up by radio engineers at the Rock Ridge station in Oakland and at the office of the Morehead laboratories, San Francisco.

The significant feature of the test in the development of radio telephony, is that it was transmitted with low power on a short wavelength, available to amateurs.

The test was arranged through the co-operation of the General Electric Company of Schenectady and the Atlantic-Pacific Radio Supplies Company of San Francisco.

Three and a half kilowatts of power were used in transmission on wavelengths of 360 meters.

The receiving set at Rock Ridge, Oakland, was equipped with two stages of radio amplification and two of audio amplification.

◆ ◆ ◆

N. Y. State Incorporates Many Radio Companies

TAKING advantage of tremendous interest being shown these days along radio lines, many companies were incorporated in this State last month for the purpose of manufacturing radio apparatus. A summary issued by Secretary of State John J. Lyons covering the activities of the corporation bureau last month as well as furnishing comparative figures for the first quarter of this year and the same period in 1921, furnishes additional proof that the hesitancy which characterized companies embarking in business is rapidly becoming a thing of the past.

During the month of March, a total of 1,717 companies having an aggregate capitalization of $58,411,250, were incorporated by Secretary of State Lyons. These figures represent an increase over February of 284 companies and a capitalization of approximately $7,000,000.

Chevrolet to Use Radio in Auto Race

A WIRELESS telephone will be used by one driver in the 500-mile automobile race at the Indianapolis motor speedway May 30 to keep in touch with his pit during the long grind. The car, a small one of popular make, but rebuilt for racing purposes, was designed by Louis and Arthur Chevrolet, of Indianapolis. Louis Chevrolet designed and built the winning cars in the 1920 and 1921 races.

Pointing out that drivers and mechanicians lost track of their standing in the long race after they have gone several laps, the Chevrolet brothers declared the wireless telephone will enable the automobile pilot to keep in constant touch with his pit and know at all times his place and other valuable information.

Jack Curener, of Greenville, Ohio, who has been selected to drive the car, is in the city working on it. To make the use of the wireless possible a small device will be placed on the rear of the car to catch the waves as the machine speeds around the track.

◆ ◆ ◆

Illegal Possession of Radio Tubes

WITH the arrest of Jewell Van Dyke and his brother Carl, heads of the Van Dyke Electric Company, Asbury Park, N. J., by a United States Deputy Marshal on a charge of illegal possession and displaying for sale Government radio tubes, officials at Camp Vail announce the belief that many amateur radio operators possess stolen tubes and on May 1 a drive to recover them will be made.

The Van Dykes were held in $1,000 each by United States Commissioner Carton. It is alleged that United States "V. T. I." radio tubes were found at their store.

Since their arrest many tubes had been returned to the camp. The Van Dykes said they were unaware that the tubes bought by them had been stolen.

◆ ◆ ◆

Radio to Link America With Sweden

FOR the first time in history Sweden and the United States will have direct telegraphic communication through the erection of a high-power radio station which is to be constructed immediately on the Swedish west coast. Heretofore all cable or radio communications between the two countries were relayed from London or Paris.

The Riksdag long ago appropriated the initial sum of 2,000,000 kronor, more than $550,000, to begin the work, but it was not until recently that the Swedish State Telegraph Board and the Radio Corporation of America reached a satisfactory agreement, under which the fees for all radio traffic will be divided equally between the two countries.

It is calculated that the cost of the new station will not exceed 5,000,000 kronor, about $1,400,000. One reason for an immediate start is the serious unemployment situation in Sweden.

The total telegraphic traffic between Sweden and North and Central America amounted last year to 1,660,000 words. The head office of the new station will be located in Gothenburg.

◆ ◆ ◆

Bank Payments Ordered By Radio

THE Farmers' Loan and Trust Company announce that arrangements had been completed with the London Joint City and Midland Bank, Limited, which will enable wireless payments to be made at any time to passengers en route on board the Mauretania, Aquitania and Berengaria. Through branch banks on board these ships passengers also may order payments made through the Farmers' Loan and Trust Company to persons in this country.

◆ ◆ ◆

Direct Wireless Between England and Australia

THE Amalgamated Wireless (Australasia), Limited, of Sydney, has been authorized to establish and conduct direct wireless communication between Australia and England, and also to take over and develop the entire Australian wireless services. A new board of directors will be formed for the Australian wireless company, which will consist of seven, three representing the Commonwealth Government, three representing the Amalgamated Wireless (Australasia), Limited, and a seventh director to be selected mutually.

Within two years Australia will be in direct communication with England through, high-powered wireless stations erected in each country, and a commercial wireless service will be available at rates for all classes of traffic which will be two-thirds of the existing cable rates.

Radio on Airplanes

SEAFARING airplanes will be as safe as a chair at the opera if all the new regulations announced by Secretary of the Navy Denby are strictly enforced.

The regulations provide that all airplanes that make long passages be equipped with radio sets of sufficient strength to communicate with a ship or station at the near end of the passage. It is also planned to install radiophone outfits on all mail machines. The apparatus will have an operating radius of 200 miles to afford the pilot constant contact with the station just left or the one ahead.

◆ ◆ ◆

Radio Shows

THE Electrical Contractors' Association of Brooklyn and Queens will hold its first annual radio and electrical exposition at the Brooklyn Ice Palace, corner of Bedford and Atlantic avenues, from May 6 to May 20, inclusive.

Headquarters have been opened at the McAlpin Hotel for the Radio Show which will be held at the Seventy-first Regiment Armory, Thirty-fourth street and Park avenue, New York City, the week of May 22-29.

Announcement of a National Radio Exposition to be held in the Leiter building, Chicago, June 26 to July 1, has been made by Milo E. Westbrooke, its manager.

The annual Chicago Radio Show will be held in the Coliseum in Chicago, from October 11 to October 22, according to a communication received from U. J. Herrmann, manager of the show.

◆ ◆ ◆

New English-Swiss Wireless Service

A NEW high-speed commercial wireless service between Switzerland and England is being carried on by stations which have been specially erected for the purpose by the Marconi Company in Switzerland and England, capable of handling traffic at a speed of 100 words per minute in each direction.

The signals received at the English end are automatically relayed to London, and there recorded in Roman characters. The English transmitting station is automatically operated from Radio House, Finsbury, London.

The usual telegraphic rates will apply to this new service and messages intended for transmission by this route are accepted at all Post Offices.

Charging Storage Batteries From A. C.

The Tungar Rectifier Provides an Easy and Safe Method for Keeping Batteries Fully Charged — Practical Instructions for Its Installation and Operation

By C. E. Hamann
General Electric Company

THERE are, according to Secretary of Commerce Herbert Hoover, 600,000 amateur radio operators in the United States, and the number is increasing with great rapidity.

With this large and growing number of radio outfits in use, the problem of charging the storage batteries used in connection with them, assumes corresponding importance and interest and the trend is naturally, in the direction of obtaining rectifiers for charging these batteries at home rather than transporting the batteries to and from a battery service station.

Gas-filled tube rectifiers are becoming increasingly popular for this purpose, but while considerable information has been published on the theory of the "hot cathode" rectifier, little or no data has been afforded the amateur on its practical operation in the radio station.

Among the successful types of rectifiers which have been in use for some years for charging automobile storage batteries is the Tungar, which has recently been developed for a similar purpose in charging radio outfit batteries. The practical application of this type for this purpose will be discussed in this article. These sets are made in various sizes, from a very small outfit for railway signal work, delivery only a fraction of an ampere, up to large service station outfits capable of charging ten or twenty automobile batteries simultaneously. For radio work the small, portable type, built in two-ampere and five-ampere capacities, is preferable.

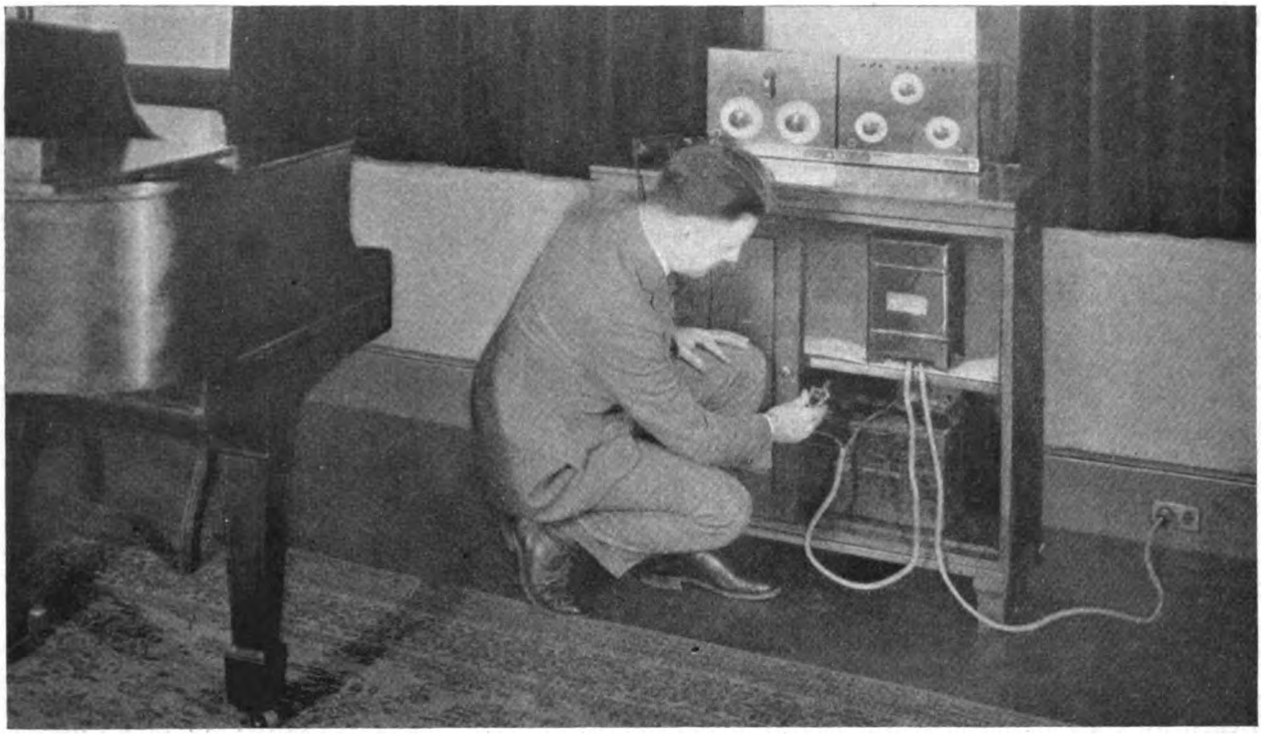
No attempt will be made to describe the theory of the bulb. This is generally similar to the theory of the two-element vacuum tube, with which the average radio "fan" is familiar. A simple comparison can be made by comparing the action of the bulb to that of a one-way valve. During one-half of the cycle, current flows through the bulb from anode to cathode—that is, from "plate" to filament, but during the other half cycle, no current can flow; hence, the term "half-wave" rectifier.

At first thought it would seem that the efficiency of a "half-wave" rectifier" would be very low—not over 50 per cent. Further consideration, however, will reveal the fact that on the half-cycle, when no current is flowing through the bulb, no energy is being drawn from the line, except a small amount for heating the filament and exciting the transformer. As a matter of fact, some of the larger types of "half-wave" rectifiers have an efficiency as high as 75 per cent.

It is quite feasible to obtain "full-wave" operation by using two bulbs." Such an outfit, however, is more complicated, and necessarily, more expensive. Therefore, as a pulsating direct current is satisfactory in every way for battery charging, the simple half-wave rectifier is the type most commonly used.

Figure 1 shows an elementary diagram of connections for a rectifier using a Tungar bulb. The filament is excited from a low voltage source, such as a battery or a transformer. An adjustable resistance regulates the amount of charging current flowing through the battery. Obviously, an arrangement of this kind would not be satisfactory for every-day use. It would not be practical to excite the filament from a battery, as too much current would be required—the five-ampere bulb takes approximately 18 amperes at 2.5 volts for filament excitation. A resistance for regulating the charging current would be inefficient and wasteful. In order to overcome these objections, a small auto-transformer is used in the standard Tungar outfit.

In the five-ampere one-battery type the auto-transformer has two secondary windings, one consisting of a few turns of heavy wire for furnishing the filament current, and the other consisting of a greater number of turns



Practical installation of a Tungar outfit for charging storage batteries in the home for supplying the current for charging the battery. Three taps are brought out near the end of the primary winding which are used to adjust the outfit for various line voltages.

Because of certain characteristics of the bulb, the auto-transformer must be carefully designed. The voltage required to make the bulb "pick up" or start rectifying, is considerably higher than the voltage necessary to maintain the arc after the bulb starts operating and an arrangement is therefore provided to lower the voltage as soon as the bulb starts rectifying—to prevent burning out the bulb. This inherent reactance regulation has an additional advantage in that it tends to hold the charging current more nearly constant when the line voltage varies.

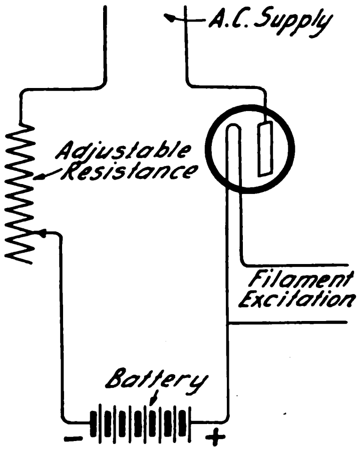


Fig. 1

Elementary diagram of connections

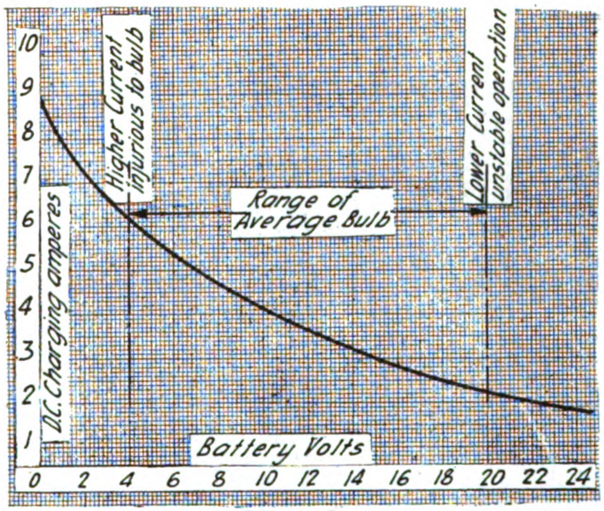


Fig. 2

Electrical characteristics of the 5-ampere type

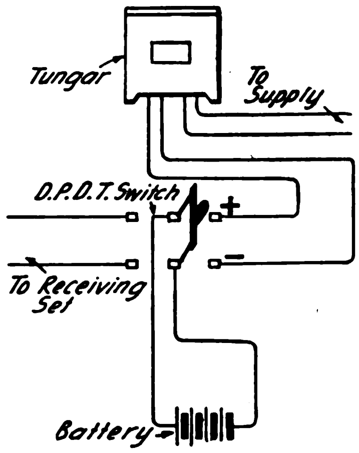


Fig. 3

"Safety first" method of connecting the rectifier to storage battery

Figure 2 is a curve showing the charging current obtained with various numbers of cells of battery connected to the outfit. This curve was made with a five-ampere outfit. It will be seen that the rectifier delivers approximately five amperes with a 3-cell load, and three amperes with a 6-cell load.

When choosing a Tungar for use in the radio station, several things must be taken into consideration. First, is the selection of the proper size of outfit. The choice of a 2-ampere or a 5-ampere Tungar is not, as it might at first appear to be, simply a question of the relative fatness or slimness of one's pocketbook. Each of these machines has its own field of usefulness.

In general, if the battery to be charged is of low capacity—as for example, not over 40 ampere hours—the 2-ampere size should be selected. For larger batteries the 5-ampere size is preferable, as it will charge the battery in a much shorter period of time.

Another point that should be considered is the load on the battery; that is, the extent to which it will be discharged when operating the receiving set. If only a single tube outfit is used, the discharge rate will be only about one ampere. Figuring roughly that the receiving outfit is in operation an average of three hours per day, then the total discharge would be three ampere hours. In this case the 2-ampere size would be entirely large enough, regardless of the size of the battery. Operating the rectifier for one and one-half to two hours per day would keep the battery in a fully charged condition.

On the other hand, if a 3-tube receiving set is used, the total discharge of the battery will be nine ampere hours per day on the basis of operating the set three hours per day. To keep the battery charged with a 2-ampere rectifier would require a charging period of five or six hours per day, whereas with the 5-ampere size, a two-hour charge per day would be ample.

Many operators allow their batteries to run down completely before recharging. This has two disadvantages. Batteries have an exasperating way of going dead in the middle of some important DX work, or perhaps when a long-distance concert is being heard. When a battery is completely down, a long period of charging is necessary to bring it up. Meanwhile the station is out of commission.

The only sure way of avoiding these annoyances is to give the battery a short charge every day or two, thereby maintaining it in a fully charged condition. It will interest the amateur to know that the construction of the Tungar has been approved by the National Board of Fire Underwriters. This means that it is perfectly safe to put the battery on charge, lock up the station and go away, leaving the battery charging. Should the A.C. line voltage fail at any time, it is impossible for the battery to discharge back through the Tungar.

A simple and convenient way of connecting the rectifier to the battery is by means of a double throw, double pole switch, as shown in figure 3. This arrangement has a safety feature, in that the rectifier cannot be connected to the battery without first disconnecting it from the receiving set.

If this switching arrangement is not used, the operator should always bear in mind the fact that the receiving outfit must be disconnected while charging. If an attempt is made to operate the receiver while the battery is charging there will be a very loud, disagreeable hum in the phones, particularly if an amplifier is used. This is due to the pulsating current from the rectifier, which super-imposes a ripple on the straight-line voltage of the battery.

There is also another objection. As stated, the Tungar uses an auto-transformer. By referring to figure 1 it will be seen that there is a direct connection from the A.C. line through the auto-transformer to the battery. In practically all A.C. lighting systems one side of the line is grounded. In some types of radio receivers the connections are such that the filament circuit is grounded. Under these conditions it is possible to have a direct connection from the high side of the A.C. line through the rectifier and the receiving set to ground, and the resulting flow of current may be enough to damage both rectifier and receiving set.

If any experimental work is contemplated in which the Tungar will be connected to the radio set, it will

(Continued on page 56)

Recording High Speed Signals in Radio Telegraphy

By Julius Weinberger

Research Engineer, Radio Corporation of America

THIS paper deals with the development and operation of a practical system for the handling of radio telegraphic traffic at high speed, particularly in trans-oceanic communication. By high speed working we refer to operation at speeds greater than those customarily employed for telephonic reception, that is 20 to 25 words per minute by average good operators.

With the continually increasing expensiveness of equipment, and the tendency towards increase of transmitting power (so as to insure reliable communication at all times), it has become apparent that the profitable operation of a long distance radio system depends greatly upon working at a rate of speed in excess of that obtainable by hand. Most of the high power radio transmitters of today are equipped with relay systems capable of sending as high as 100 words per minute, and there is no particular reason why, if necessary, powerful vacuum tube amplifiers could not be built to take the place of relays and be worked at considerably greater speed. The limitation of working speed is practically confined to the receiving side of the radio system, so that it is obvious that increased speed possibilities must be obtained entirely by the development of receiving apparatus.

In order to understand the conditions under which high speed recording apparatus must work, it will be well to describe briefly the manner in which communication is carried on over the trans-Atlantic circuits of the Radio Corporation. Figure 1 illustrates the method of duplex working. It will be noted that the operation is from New York City, while the transmitting and receiving stations are placed at some suitably distant point; and it is intended to concentrate most of the Atlantic Coast transmitters in a central plant at Port Jefferson, Long Island, while most of the receivers are concentrated at Riverhead, about 18 miles from Port Jefferson. All control of the various transmitters and receivers is from New York City, the sending operator controlling a transmitter via telegraph line and the receiving operator having the received audio frequency signal brought to him via telephone line. The transmitting and receiving operators are located close to one another (at a common table), so as to facilitate duplex operation. The receiving operator can thus instantly communicate with the distant transmitter, if desired, in order to control the speed of transmission, or stop the transmission in case of trouble. The operators themselves handle no apparatus whatsoever; the receiving and transmitting apparatus is handled by engineers at the respective stations, and such apparatus as is necessary for wire transfer line at Broad Street is placed in a room separate from the operating room and maintained by men of suitable qualifications.

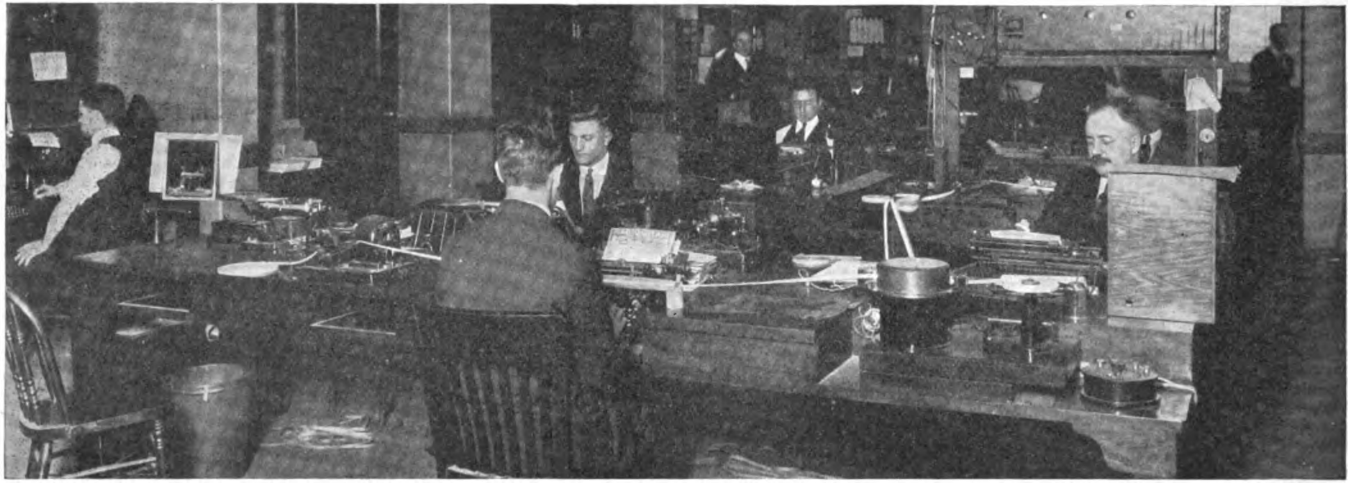


Figure 2—Part of the Radio Corporation operating room with the recorders in use

Requirements of High Speed Recording Apparatus

The foregoing operating arrangement, as well as certain service standards, imposes a series of requirements upon high speed recording apparatus which are given below:

1. Minimum delay between the time of recording and the time of transcribing the signals. This is of importance in

(a) Successful duplex operation: In case of trouble (for example, bad relay adjustment in the transmitting station) or for other reasons, it may become necessary to stop the distant transmitter. If the record is not immediately perceptible, a considerable quantity of traffic might be sent which was not properly recorded, and which would then have to be repeated with consequent loss of circuit time and delay in delivery.

(b) Prompt delivery of messages to the customer.

(c) Observation of the effect of adjustment of the receiving or transmitting apparatus.. It is essential that a minimum delay shall occur between the time a change of adjustment is made and the time the effect of the change is perceived.

2. The cost of recording must be as low as possible—not over a few hundredths of a cent per word. This is important since a large class of reduced rate traffic, such as press matter, deferred delivery messages, and the like, is handled at high speed. Furthermore, the future operating of short distance radio circuits with low rates must be taken into consideration, since the equipment designed for long distance working should be standardized for all classes of service if possible. Therefore the initial cost of the equipment must be low, as well as the operating and maintenance charges.

3. The recording equipment must be as simple and rugged as possible, and require no continuous attention; since it must be located near the receiving operators and handled by the telegraph supervisors, who generally do not have extensive technical or engineer qualifications. The parts of which the equipment is constructed should be

capable of easy repair in case of breakage, as far as possible, by the men and facilities available in the operating rooms, and spare parts should be capable of easy installation by such men. This is more important when recording equipment is furnished to stations other than those located in New York City (such as those in Hawaii or on the Pacific Coast), to which it would be manifestly very expensive to send expert repair men.

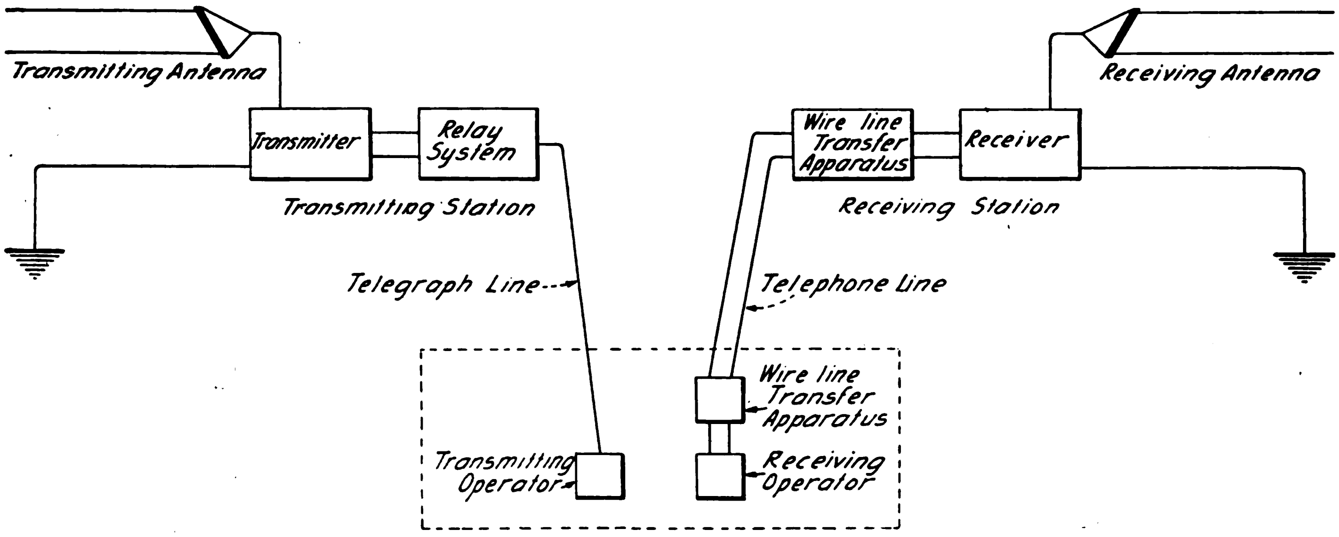


Figure 1—Method of centralized operation

4. A record capable of preservation is highly desirable, so as to check up errors, and for use as a means of traffic study and general service improvement.

5. The tone signal which is sent over the telephone line from the receiving set may be anywhere between 500 and 1,500 cycles. Although the lines will transmit, theoretically, frequencies up to 2,200 cycles, it has been found in practice that better transmission is secured by keeping signals below about 1,500 cycles. The recording equipment must be capable of accepting any given frequency in this range, and allow for a considerable fluctuation above or below this frequency. It has been found in practice that at present frequency fluctuations of several hundred cycles must be taken into account with some European transmitters: though improvements in this respect no doubt will be made. A fluctuation of signal intensity of the order of perhaps 2 to 1 must be taken into account, due to accidental changes in line conditions, amplifier adjustments, or during tuning of the receiving equipment at the distant station.

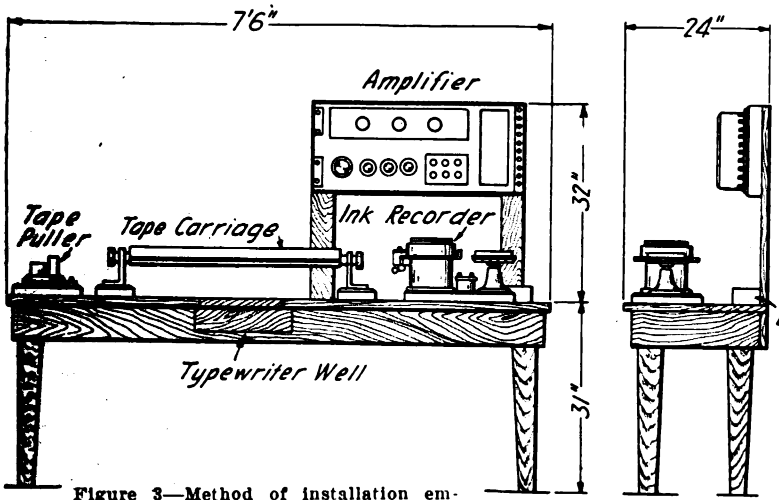
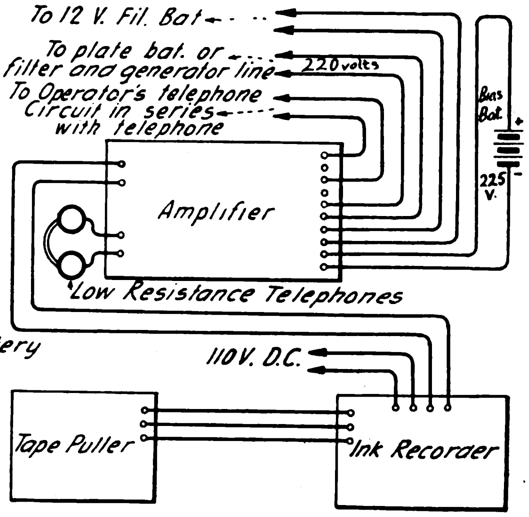


Figure 3—Method of installation employed at receiving stations


To 12 V. Fil. Bat
To plate bat. or filter and generator line
220 volts
To Operator's telephone Circuit in series with telephone
Bias Bat.
225 V.
Amplifier
Low Resistance Telephones
110 V. D.C.
Tape Puller
Ink Recorder

6. Speed limitations: Present practice in long distance high speed working is on the basis of from 40 to 50 words (200 to 250 letters) per minute, and at times higher speeds, up to 80 words per minute, have been commercially handled. The limitation lies in relay trouble at the transmitting end and strays at the receiving end of the circuit. It is probable that working at 100 words per minute will eventually become the rule though not for a number of years. Hence, a recording system should be able to handle easily speeds up to 80 words per minute, and be so designed that extension to higher speeds (say, up to 200 words per minute) can be accomplished by simple modifications, for use on short-distance circuits. It is interesting to note, in this connection, that European short-distance radio circuits, for example, London-Paris, and London-Berlin, are understood to be operating regularly at 60 words per minute, and operation up to 100 words per minutes has been carried on at times.

7. The perception of the recorded signal by the operator should be made as easy as possible. The operator has not the time to study the record, and an easily perceived record at lower speed is preferable to one at a higher speed, which requires study on his part. For example, in graphic recorders the contrast between recorded signal and background should be great, the letters clean-cut, so that the operator perceives them instantly, and static eliminated from the record to the maximum extent consistent with accuracy. In acoustic recorders, such as the phonograph or the telegraphone, the signal heard by the transcribing operator must be clear and loud, free from musical static and with firmly-

formed dots and dashes. It is difficult to over-estimate the importance of this requirement; it has a great influence on commercially successful operation, for the speed at which operators will handle traffic depends considerably on the clearness of the signals with which they deal.

8. The effort necessary, on the part of the operator, to distinguish the signal from such record as may be produced by static, in the ideal case, should be equal to or less than that necessary for aural reception with head telephones.

9. Continuous operation of the recording equipment is essential. In the case of acoustic recorders, where it takes some time to place a new record on the machine, two overlapping recorders must be used, one being started just before the record is removed from the other. But the installation of two machines is uneconomical and continuous operation should be provided for, in the ideal recorder, in a single machine.

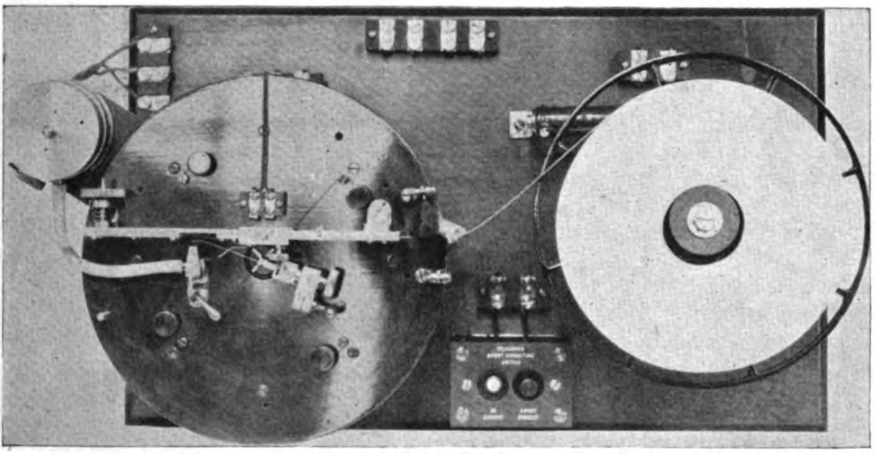


Figure 5—The commercial type of recorder

While the development of the recorder was being carried on, experiments were conducted simultaneously to determine a suitable amplifier system, the input of which was to be connected to the radio receiving equipment in place of the operator's telephones and the output of which was to supply the recorder with a direct current of 2 to 4 milliamperes, through the 1,000 ohm recorder coil. Aside from furnishing the required amplification, it was desired to utilize the amplifier circuits to secure as great a discrimination as possible between the signal audio frequency and strays.

The method of installation employed at outlying receiving stations is indicated in figure 3. The recorder, tape puller, and tape carriage are mounted on a common table, and a typewriter well is placed so that the operator may copy directly from the tape. The amplifier is mounted on a panel conveniently near the recorder, so that tuning or other adjustments may be made while their effect is observed.

In the central station of the Traffic Department of the Radio Corporation, New York City, the amplifier equipment is separate from the operating room. Here a special amplifier is employed in which the amplifications necessary both for wire line transfer and recording are combined. The recorder is placed beside the operator.

The above method of having one operator copy directly from the tape is suitable up to a speed of about 45 words per minute. Above this speed several operators may read the tape in succession, in the manner used in cable offices. That is, one man is placed near the recorder, a second perhaps ten feet along the tape, and a third man ten feet further along. The first man copies from the tape, which is moving faster than he can keep up with, until he reaches a point where the signals are nearly out of easy sight. He then stops copying, marks the point on the tape at which he stopped, and starts in again as near the recorder end of the tape as he can see easily and marks on the tape the point at which he has started again. The second man then starts copying at the point at which the first man left off and copies the intervening material, either up to the point at which the first man started again, or else as far as he can. If he cannot read all the material omitted by the first man he also marks the point at which he left off, and the third man completes the copy of the omitted material. By this method the transcription of traffic at 100 words per minute by three men is readily possible.

Figure 2 is a photograph of part of the Radio Corporation operating room, in which some of the recorders may be plainly seen. In this office, a recorder is placed on each transoceanic receiving circuit, and, in addition, arrangements are made to keep a record of the outgoing signals from each transmitter. This is accomplished by means of an antenna on the roof of the building, connected to receiving sets and recorders in the apparatus room; this equipment easily receives all of the local transmitting stations, and the signal leaving the sending operator's key or Wheatstone transmitter may thus be directly compared with the signal radiated from the transmitting station's antenna. In this way, line or relay faults, trouble in the transmitting station, and the like, may be instantly noticed, and a check also kept on operating errors.

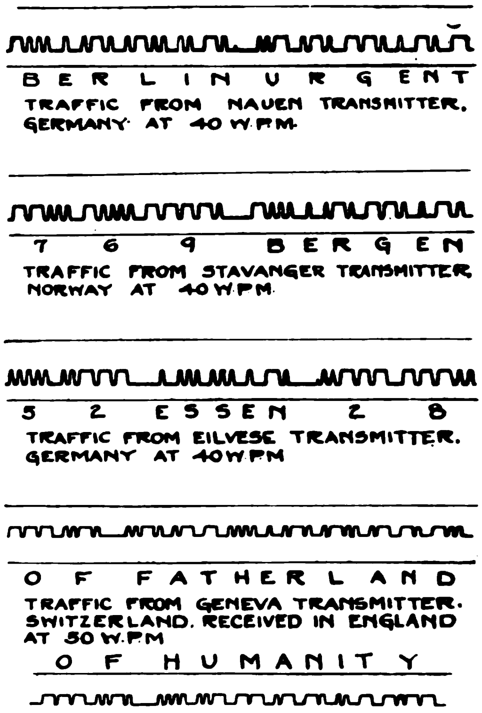

BERLIN URGENT
TRAFFIC FROM NAUEN TRANSMITTER, GERMANY AT 40 W.P.M.
769 BERGEN
TRAFFIC FROM STAVANGER TRANSMITTER NORWAY AT 40 W.P.M.
52 ESSEN 28
TRAFFIC FROM EILVESE TRANSMITTER. GERMANY AT 40 W.P.M.
OF FATHERLAND
TRAFFIC FROM GENEVA TRANSMITTER. SWITZERLAND. RECEIVED IN ENGLAND AT 50 W.P.M.
OF HUMANITY

Figure 4—Typical ink recorder tapes

In figure 4 a number of typical tape records taken on the ink recorder are reproduced. These are of various European transmitters recorded in the United States, while the last one is a record of the valve transmitter at Geneva (Switzerland), used on the Geneva-London radio circuit, taken on the ink recorder system at an English station.

Charging Storage Batteries From A. C.

(*Continued from page 53*)

be well to purchase one with an insulated transformer — separate primary and secondary — instead of the usual auto-transformer type. These are designated as "Form B" outfits, and can be obtained from the manufacturer. The same protection can be obtained with a standard Tungar by connecting a "1 to 1" insulating transformer in the line side.

The same care should be given the bulbs as is given radio tubes. In any experimental work connect a rheostat and an ammeter in the D. C. circuit so as to prevent a current of higher than five or six amperes from flowing. With reasonable care the life of Tungar bulbs will average 1500 to 2500 hours of actual service.

Remarkable Distance Records by 6XAD

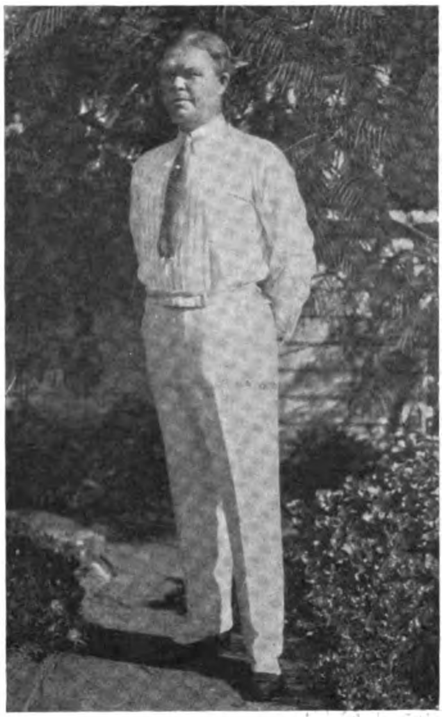
Trans-Continental Work Done Repeatedly by Transmitter Employing Four Five-Watt Tubes—Signals Reported From New England, Bermuda, Alaska and Honolulu

PROBABLY the most remarkable distance work ever done by any amateur station of equal power using four 5-watt tubes is the station 6XAD, Avalon, Catalina Island, Cal., owned and operated by Lawrence Mott, Major, Signal Division O.R.C., U. S. Army, and President of the C.W. Association of America.

The consistent long-distance work done by Mr. Mott has attracted the attention of the regular army folks and quite recently the Chief Signal Officer of the Army, Major General George O. Squier, had several of the Signal Corps engineers make a comprehensive study of the station, including its equipment, geographical surroundings and accomplishments, in order to determine, if possible, the reason for the unparalleled results obtained.

At this point in the story it might be well to record the fact that Major Mott regards anyone who has never visited Catalina Island, as unfortunate, extremely unfortunate, in fact, in that they have missed enjoying one of the wonder spots of the world.

Anyway, 6XAD, is located in almost the center of Major Mott's wonderland, in an elliptical bowl of hills, whose highest point is 2,600 feet. The arms of this bowl run straight down to the island's shore where the waters of the Pacific lap lazily against the sands of the island where, according to Major Mott, the sun shines all the year round. The opening in the hills is toward the north-northeast, and the antenna points directly toward New York.



Major Lawrence Mott, Signal Corps, O.R.C., U.S. Army, owner and operator of 6XAD

The antenna itself, of flat top design, is supported on two masts, one 60 feet and one 94 feet high. There are seven wires in the antenna, standard Navy wire of seven strands, supported on an eight-foot spreader at the low end and on a sixteen-foot spreader at the high end, thus giving double spacing at the free end. Two-inch copper ribbons run along the spreaders, and each antenna wire is soldered to these strips, thus minimizing losses as much as possible.

The counterpoise ground of the station is of the same material and size as the antenna itself, and is stretched tightly nine feet above and parallel to the ground. The counterpoise is, of course, well insulated.

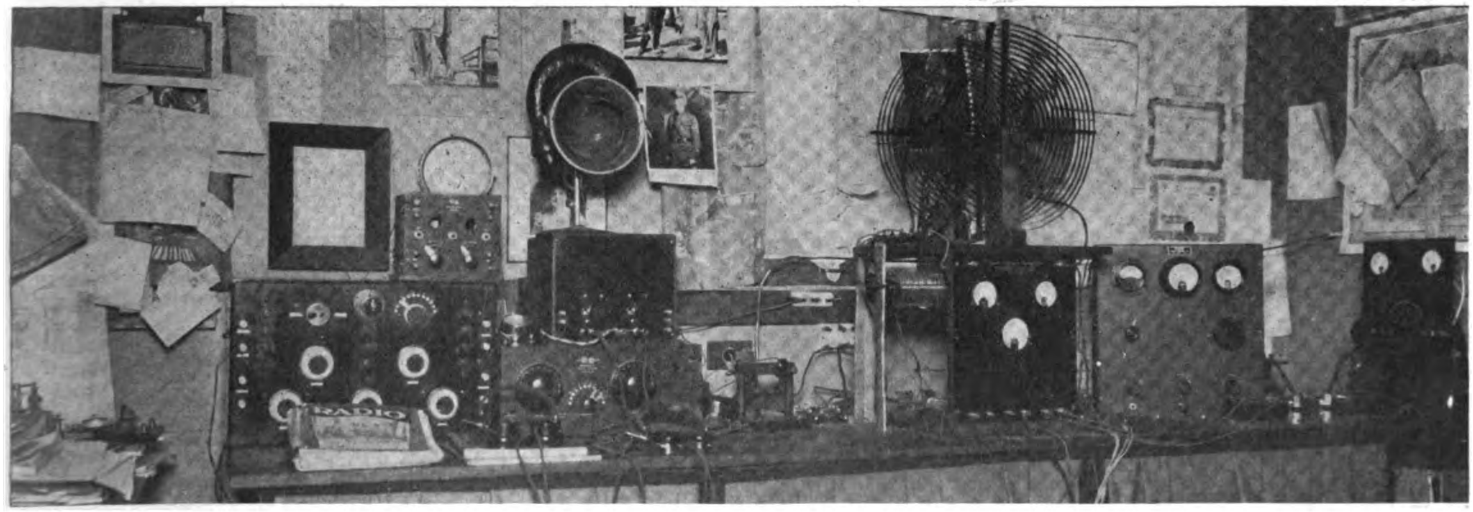
In addition to the counterpoise, an earthed ground is used, consisting of 240 metal plates, 3 x 4 feet, buried 3 feet underground. These plates are connected together by one-inch copper ribbons, leading in turn, to a 12 x 12-foot copper sheet buried five feet in the ground, directly under the operating table. In addition to these copper sheets, there are copper ribbons radiating out 30 degrees from the antenna. In order to insure a good earth ground connection the year round, metal standpipes have been put in and into these salt water is pumped every few days, thus insuring a moist condition of the ground over the whole area of the station. These metal standpipes are three inches in diameter and lead down to the buried metal sheeting at regular distances.

The station is equipped with the following transmitting and receiving apparatus:

The transmitter employing four 5-watt tubes, Radiotrons UV-202, is used principally for I.C.W. on 220 meters. The average antenna current is 2.6 amperes. It is with this set that practically all of the unusual distance work of the station has been done.

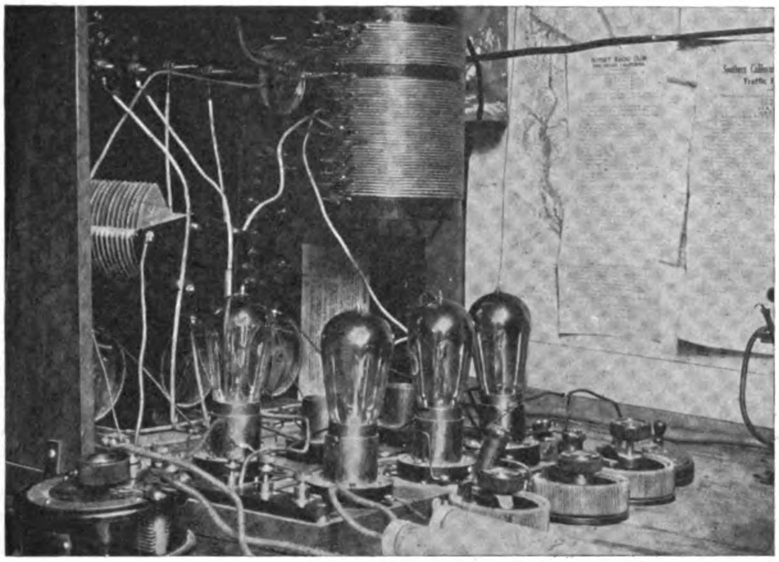
Another transmitter employs two 50-watt tubes for C.W. on 370 meters. The average antenna current is 4 amperes.

Another transmitter employs two 50-watt tubes of I.C.W., on 240 meters. Considerable experimental work has been done with this station in con-

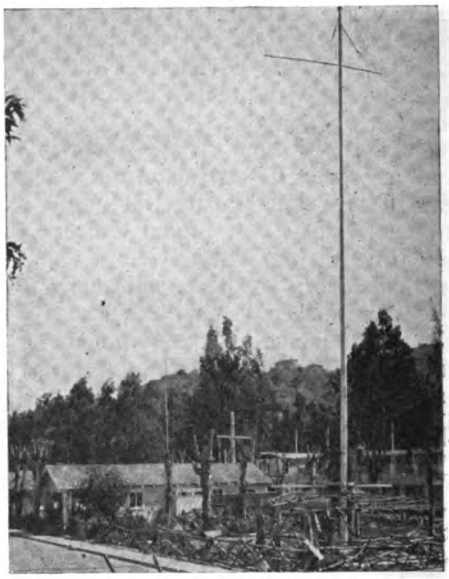


Transmitting and receiving apparatus installed at 6XAD nection with some forthcoming tests which are to be made with Australia.

Receiving equipment: Grebe CR-5, which has been used in all the unusual long-distance work of the station. A specially designed two-step Western Electric amplifier. A Kennedy long-wave receiver used in conjunction with a Grebe two-step audio-frequency amplifier.



Four 5-watt tube transmitter at 6XAD



The antenna system at 6XAD

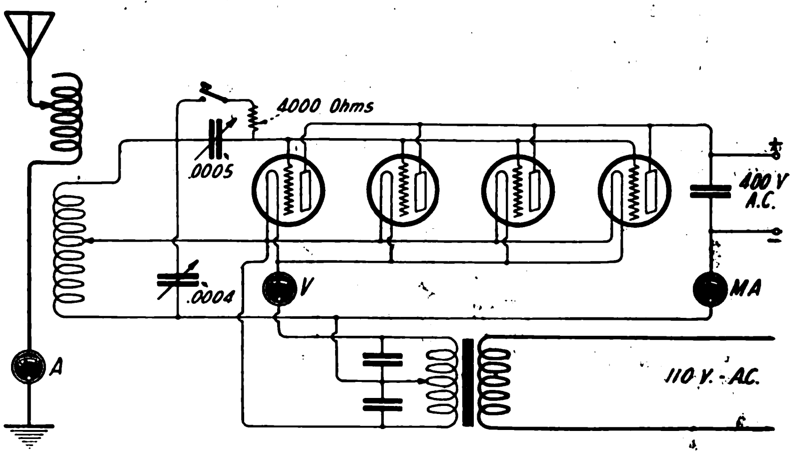
A specially designed motor-generator set, capable of delivering up to 1,500 volts D.C. with 110-volt 60-cycle drive, is used to supply plate potentials for the various transmitting sets.

The stations which have been worked by 6XAD are as follows:

3 ALN	Washington, D. C.
3 AQR	Hershey, Pa.
5 HK	Oklahoma City, Okla.
5 ZA	Roswell, N. M.
6 AWP	San Francisco, Calif.
6 JX	San Francisco, Calif.
6 ZZ	Douglas, Arizona.
7 YL	Bozeman, Montana.
7 YJ	Corvallis, Oregon.
7 ZU	Polytechnic, Montana.
8 AWP	Syracuse, N. Y.
8 AXK	Cincinnati, Ohio.
8 JL	Cleveland, Ohio.
8 ZAC	Barnesville, Ohio.
8 BRL	Crafton, Pa.
8 LX	Crafton, Pa.
9 DVA	Denver, Colo.
9 AIF	Sioux Falls, S. D.
9 AIG	Sioux Falls, S. D.
9 ZN	Chicago, Ill.
9 AJA	Chicago, Ill.
9 AMB	Denver, Colo.
9 NX	Wichita, Kansas.
9 ZAF	Denver, Colo.
9 WD	Chicago, Ill.
9 DTM	Topeka, Kans.
9 AQR	Kansas City, Mo.
9 XI	Univ. of Minnesota, Minn.
9 XM	Univ. Wisconsin, Madison, Wisc.
9 XAQ	Univ. of Colorado, Boulder, Colo.

In the case of several stations in the Third and Eighth Districts these stations either worked or heard 6XAD after daylight had been on in the East for approximately an hour.

The number of stations which have reported the signals of 6XAD is so great that it was not possible to include a detailed list with this article. Included among them, however, were stations in Vermont, Massachusetts, New York, New Jersey, Pennsylvania, Virginia, District of Columbia, Georgia, Oklahoma, New Mexico, California, Arizona, Montana, Washington, West Virginia, Ohio, Kansas, Missouri, Nebraska, North Dakota, Colorado, South Dakota, Wisconsin, Illinois, Minnesota, and Ontario, and Saskatchewan, Canada.



Circuit diagram of the four 5-watt tube transmitter at 6XAD

The following stations have been heard at 6XAD during the past winter: 1ARY, 1BCG, 2FP, 3ALN, 3AQR, 3EM, 3FS, 3LR, 4BF, 4FT, 4BT, 4ZC, 5HK, 5JD, 5ZO, 5JB, 5XJ, 5ZA, 5QA, 5YQ, 5AAQ, 7LY, 7ZU, 7FI, 7ZT, 7YJ, 7MP, 7LN, 7AAV, 7NZ, 7JD, 7GO, 7CW, 8AG, 8AM, 8EA, 8BR, 8BK, 8LX, 8IV, 8BO, 8BK, 8AIO, 8CLD, 8AGQ, 8UY, 8AGO, 8SP, 8XV, 8VY, 8HAZ, 8IG, 9BBF, 9EK, 9BL, 9BEX, 9ALS, 9ZX, 9AIV, 9AAV, 9PI, 9BJI.

In addition to the reports from amateur stations already referred to several special cases were reported. The operator of the U.S.S. Lighthouse Tender Fern reported to Mr. Mott that the signals of 6XAD had been heard by him for several weeks up and down the Alaskan Coast, the maximum distance being 1,680 miles, chiefly overland.

Mr. Dow, of Maui, Honolulu, 6ZAC, has heard 6XAD frequently during the last few months, and it is hoped that a regular schedule between these two stations can be maintained.

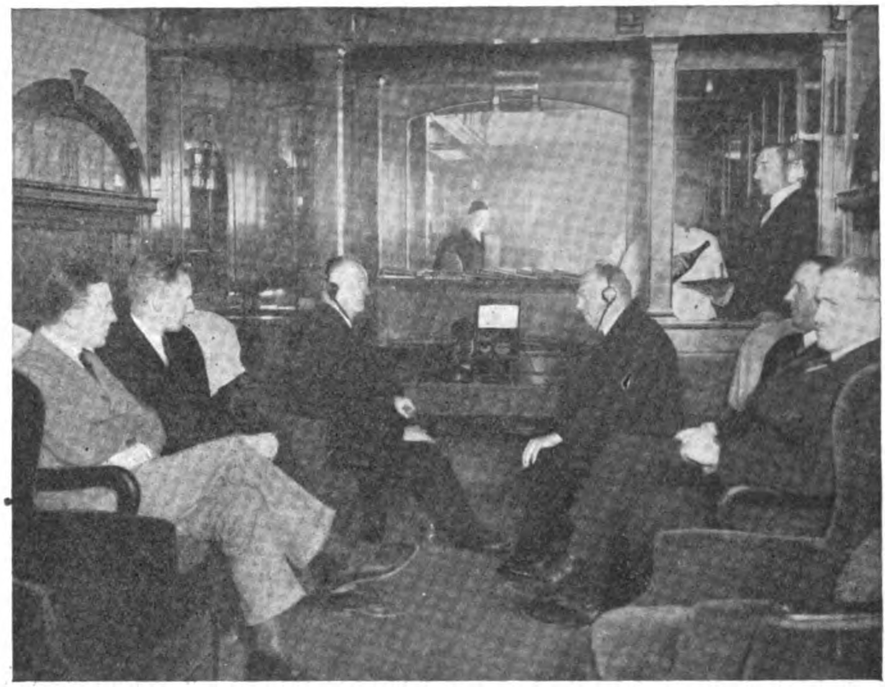
The operator of a ship recently wrote Mr. Mott that 6XAD had been heard by him while his ship was at anchor, at Hamilton, Bermuda. Mr. Mott would like further details should this article come to the attention of the operator in question.

Train Radiophone Test Successful

Voice Communication Carried On Between Lackawanna Limited and Stations Along the Route Between New York and Scranton

By David W. Richardson

IN 1914 the Lackawanna Railroad instituted the world's first wireless communication from a moving train to stations located in the principal cities along its route. Considerable success was achieved with the apparatus then available, but the war came along and further development ceased for the time being. On March 22 last, tests were again started with better equipment and the advantage of recent developments in receiving apparatus. The first test made was with a temporary one-wire antenna on a single car, on a short run to Morristown, N. J.



Underwood

Like the Lackawanna the Rock Island R.R. has been testing the train radiophone. View shows a group aboard the Golden State Limited "listening in"

A comprehensive test was made March 26. A buffet car was equipped with three 4½-inch, six-wire cages, one on each side, and one in the center. A 15-watt phone set was installed and a detector two-step amplifier, in conjunction with a regenerative set, was used. This car was placed in the Lackawanna Limited, leaving Hoboken at 10.20 A. M.

Underneath the iron superstructure of the terminal, a few local amateurs were picked up, and one or two radiophones, readable on the loud speaker. After leaving the terminal, there was a great increase in signals, and as the Bergen tunnel in Jersey City was approached, many local amateurs were picked up. Inside the Bergen tunnel, which is 4,283 feet long and 90 feet underground, one or two C.W. stations and several ships were heard distinctly. Upon emerging from the tunnel signal strength increased with a "bang." Going through Newark and the Oranges, various tests on the transmitting set were conducted, and no effort was made to receive. Upon reaching Stroudsburg, Pa., a telegram, delivered to those aboard the train stated that the phone messages had been received several times along the route.

One or two long calls on C.W. were given, followed by calls on voice. When about 10 miles from Scranton, following a long call on voice, 8ARI, on 197 meters, was clearly heard calling by voice, "Hello, 'D.L.' Hello, 'D.L.' Hello, Lackawanna Limited. I am receiving your voice very clearly. Please come in and give your location." The Lackawanna Limited was then coming down the mountains at about 65 miles an hour, through ravines and cuts and through tunnels. There were hills on all sides, and one would suppose it to be a most inauspicious radio location. Communication was then established with 8ARI and conversation was kept up until the Limited had arrived in Scranton. The signal strength of 8ARI in Scranton was such that many people who gathered in the special car could hear everything said. It is to be remembered that only a one-car antenna was being used during this test. While in Scranton 8RH and 8BUW were both worked.

Upon leaving Scranton, bound for New York, a message was sent to the Scranton Times from Mr. Foley, Superintendent of Telegraph and Wireless, of the Lackawanna Railroad, via 8BUW. It was interesting to note that when 8BUW was repeating the message for verification, the Limited passed through a tunnel and the effect in this particular tunnel was hardly noticeable, although it must have been several hundred feet long. Steady two-way phone conversation was carried on until about 12 miles out, when going around a mountain, 8BUW was completely lost and was not picked up until the train had reached a large lake. Going along this lake, there was a marked increase in signals, and the following stations were listed: 8ADQ, 8BUW, 8AOE. From then on the log of the trip was as follows:

Time	Station	Remarks.
5.15	2BRB	Just readable.
5.20	1RX	Fair signals.
5.25	2BK	Strong.
5.35	1RX	Strong.

The train was now going about 60 miles per hour through the Pocono Mountains some 30 or 40 miles from Scranton.

5.37	WJZ	Faint.
5.45	1ARY	Loudest station so far.
5.47	2BM	Fair signals.
6.00	1RX	Very strong.
6.15	1CNI	Fair signals.
6.20	1BQL	Fair signals.
6.40	1GM	Very strong.
6.50	2ACY	Strong.
7.05	2AHU	Very strong.
7.10	1ADL(cw)	Strong.

Now passing over plain, and signal strength much stronger.

Telegrams were received at Stroudsburg that the voice had been heard for twenty miles out from Scranton, and that the position report had been received by C.W. while passing Elmhurst Dam, ten miles away.

The train was now down near Mountain View, N. J. WJZ was very strong and could be heard all over the car. 2IA concert in Jersey City was also of good audibility. Long distance completely blotted out by interference from local amateurs and 2FP. WJZ was held all the way into Hoboken, for the benefit of those who liked the music.

In the way of an experiment, perhaps the most interesting data gathered was that of the effect of location on signals. Nearly all previous theories seemed to be confirmed, except that of immediate proximity of rock, steel bridges, and bodies of earth. Very little difference could be noted whether the railroad ran through a steep cut, 30 or 40 feet deep or was on the level. Whenever the train went through a thickly wooded piece of land, where the trees were high, all long distance signals faded out entirely. The nearness of a body of water or a stream, even though small, seemed to greatly increase signal strength. The direction of the antenna in regard to the transmitting station was another important factor, for often, going around a curve, on a perfectly level plain, one set of stations would completely fade out and another lot come in.

As mentioned before, small contours in the earth's surface, when they are not wooded, seemed to have little effect, but the location of a mountain immediately between the train and stations in a certain locality would cut out the signals entirely. This was evident very strongly when 8BUW was lost while rounding a mountain, but was picked up again when the train came out higher up on a plain. The best signal strength of all was when passing on a high embankment across a bare plain. This seemed even better than the proximity of a lake. Of course, all these observations are from only two trips, but yet they seemed to hold true in nearly every case.

Mr. G. D. Murray, Jr., and the author, who are in charge of these experiments, will greatly appreciate any report of the signals of "DL," which is the temporary call used by the Limited. All communications should be addressed to the Department of Telephone and Telegraph, Lackawanna Railroad, Hoboken, N. J.

Radio in Mexico

By J. F. J. Maher

Chief Engineer, Cia. Radio Tel. y. Tel.
Mexicana, S. A. Juarez, Chih., Mexico

IT is not an exaggeration to say that no country in the world presents as many problems of communication as the United States of Mexico. The Republic covers an area of 768,883 square miles, with long stretches of coast on both the Atlantic and Pacific oceans, and inland immense areas of fertile and desert, tropical and temperate lands run from sea level to altitudes of over eight thousand feet. On the map it lies between 15° 0′ and 32° 30′ north latitude, and 87° 0′ and 117° 0′ west latitude. This takes in every condition of atmosphere imaginable, at least where it concerns radio communication, and there is more than one radio man here firmly convinced that Mexico is the great headquarters of old man Static.

There are now twenty-three radio stations in operation, nine on the coast, and fourteen in the interior. Inasmuch as they are not listed in the call books, it seems advisable to list them here:

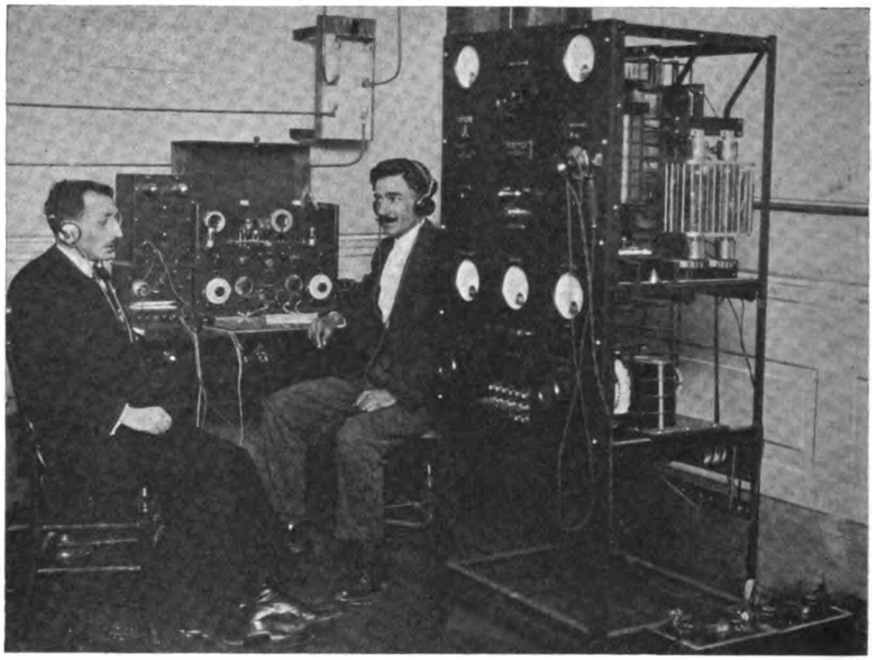
Interior Stations:

XDA	Chapultepec, D. F.
XDB	Saltillo, Coahuila.
XDC	Torreon, Coahuila.
XDD	Queretaro, QTO.
XDE	Chihuahua, Chih.
XDF	Guadalajara, Jalisco.
XDG	San Luis, Sonora.
XDH	Oaxaca, Oax.
XDJ	Mexicali, Baja Cal.

Coast Stations:

XAA	Vera Cruz, Ver.
XAB	Campeche, Cam.
XAC	Payo Obispo, Q. R.
XAD	Alamos, Sonora.
XAE	Mazatlan, Sin.
XAF	La Paz, Baja Cal.
XAH	Hermosillo, Son.
XAI	Tuxpam, Vera Cruz.
XAJ	Tampico, Tam.
XAK	Acapulco, Guerrero.
XAL	Puerto Lobos, Ver.
XAM	Merida, Yucatan.
XAN	Santa Cruz, Oax.
XAO	Isla Maria Madre, Nayarit.

The principal station is at Chapultepec in the outskirts of Mexico City, and is rated at 200 kilowatts for the largest set, and twenty kilowatts, five and two, for the smaller equipments. With the exception of one small tube transmitter, all the apparatus is of the quenched-spark type. However, these will be all supplanted by the more modern and tremendously more efficient continuous wave transmitter, such as is now used by the State Government of Chihuahua, a picture of which is shown. This is a two-kilowatt set of American manufacture, adaptable for either telegraphy or telephony, and charges an umbrella antenna supported by a 240-foot steel tower. The antenna current is normally about twelve amperes using counterpoise. Power is supplied from a ten-kilowatt Westinghouse 60-cycle generator, operating a 2,000-volt motor-generator unit. It has been found necessary to replace the prime mover, a gasoline engine, with a crude-oil Fairbanks machine, due to the instability of the former.



Official radiophone station of the State of Chihuahua

Civilian wireless is becoming quite as much a problem in Mexico as it is elsewhere for the manufacturers, and they will be hard put to take care of the tremendous demand for apparatus. However, the more serious problem is in connecting up some 160 cities and large towns, not to mention the innumerable villages and isolated industries, now without telephone communication.

Recently I conducted a series of experiments on trains of the national lines to determine the practicability of using radio telephony to supplement the present system of dispatching trains. I have had the pleasure of being present at a number of original experiments in wireless communication of these and former days, but I cannot recall anything that gave quite the same thrill as talking from a Mexican express train going forty miles an hour from the capital to Loredo. We installed a set recently at the Hotel Regis, Mexico City, and the first night everyone wanted a concert from the states. That it was a large order can well be appreciated, but what is a few thousand miles to a good amplifier? Presently we heard music and then it stopped, and a voice said, "Hello — Hello — Hello, this is the broadcasting station of the General Electric Company, Schenectady, New York, this is the last selection of the evening, please write." Well, that was quite a thrill, also. The local papers talked about it for a week, and radio occupied the front page to the exclusion of other news items such as recognition and oil. Any night we hear amateurs, hundreds of them, from New York to San Francisco, some loud as a nearby Klaxon.

I should like to arrange for telephone tests this Fall with those who may be interested.

Emergency Radio Equipment For Airplanes

By G. H. Daly, D. S. M.

Lieutenant R. A. F. Reserve

IT may sound rather absurd to talk about sending an SOS from an airplane when anything goes wrong, but proper consideration of the matter will dispel the absurdity of the idea. It must be remembered that very few people are killed in the air — it is when the aircraft hits the ground that objectionable things happen.

Consider for instance that an airplane is flying through the air and the engine suddenly stops. In nine cases out of ten the pilot will be able to "land" the airplane safely, but if the landing takes place in the sea out of sight of the shore, or in the middle of some desert—and no one knows that the plane has "landed" — the chances of rescue are doubtful, to say the least. On the other hand, if the operator sends out a distress call as soon as the trouble occurs, there is a good chance of the occupants of the aircraft being picked up.

As airplanes are equipped at present it is only possible to send out wireless signals while the aircraft is in full flight. If an air-plane has "landed" on the sea or ground before the operator has had time to send out a distress signal no signal can be sent, and needless to say innumerable cases of hardship and loss of life have occurred in this way. This has been especially the case where marine aircraft is concerned. On one occasion, to quote a well-known example, a seaplane crew which included a wireless man, floated about for four days without food or water just because the wireless set automatically became useless directly the seaplane "landed."

Somewhat similar accidents frequently happen to aviators whose line of flight takes them across the desert. They may suddenly find it necessary to land through engine trouble some hundreds of miles in the heart of the desert, and if it is impossible to get a wireless message sent out before the plane lands, only those who have suffered the torments of sun-blistered skin, tramping over loose sand, and the agonies of thirst and sandstorms, will realize what it means to come down in the heart of the desert.

Last year the French General Laperine set out to fly across the Great Sahara Desert of Africa from Tamaurasset to Timbuctoo. He never reached his destination. Proof has since been established that he was forced to land on the desert and although his machine was fitted with wireless, no signals were received from him probably because there was no time to transmit before the plane landed in the desert, and of course once the plane was on the ground the wireless was useless.

Underwood

"Flying Parson" Maynard, Jeannette Vreeland and Miss Thais Magrane who gave a radio concert from an airplane in flight recently.

There are two reasons for the impossibility of wireless transmission once a plane has "landed." First, there's no available primary voltage because the generator for supplying the primary voltage is driven by a small propeller which is driven by the draught of air from the airplane propeller, so that when the airplane lands and the propellers cease to revolve there is no power for the wireless set.

It might be mentioned here that the propeller of the generator is not driven by the draught of air from the main propeller on some aircraft, but is made to revolve by the force with which the aircraft is flying through the air, and in this case also the generator is quite as useless for functioning once the aircraft "lands" as when the former arrangement is used.

Another reason for inoperation of the airplane wireless set from the ground is the trailing aerial generally used on aircraft. This aerial normally hangs down from one hundred to two or three hundred feet below the airplane. It will easily be understood therefore that directly the aircraft "lands" this aerial becomes useless.

So far no practical solution of these problems has been put forward. Some experts have suggested a small gasoline motor to drive the generator, while others are under the impression that an accumulator battery would serve the purpose. Another idea is to use a specially hand-driven generator somewhat similar to those carried in lifeboats. None of these suggestions are of very much value for, among other drawbacks, they entail added weight which results in less cargo and passengers on the aircraft.

The solving of the trailing aerial problem is less difficult, although there are still some intricate points to overcome. Experiments have been carried out with aerials rigidly fixed to the body and wings of the aircraft and although these have so far only proved efficient for reception purposes and transmission over very short distances, there is little doubt that this idea when it ultimately becomes perfected, will solve the aircraft antenna problem.

Experiments with a special type of

collapsible kite carrying an aerial of three hundred feet of seven strand copper wire has given good results. Another idea for the emergency aerial is a collapsible steel mast, built in sections, which can be run up from the body of the aircraft once it has "landed," but this again has the disadvantage of being rather weighty as well as awkward.

FOG AND AIRCRAFT WIRELESS

A striking example of the value of the wireless direction finder to aircraft in fog was given at Croydon, the London terminal aerodrome, on October 21. The inward air mail from Paris was due when a dense fog set in. Communication with the air mail was immediately established by the wireless direction finding stations, and the ground operators were able to assist the pilot of the air mail to find the aerodrome; where a perfect landing was made.

Commenting upon the above incident "Flight," a leading British aircraft paper, and the official organ of the Royal Aero Club, says:

"This incident seems to point the moral that every machine intended for passenger carrying should be equipped with wireless. It seems to be reasonably certain that if this machine had not been so equipped the pilot would, in the exceedingly thick weather which prevailed, have been compelled to make a forced landing, with it may be, untoward consequences. For their own sakes the aerial transport companies should see to this. The value of directional wireless was well established during the war, and there is no reason to think that it will be any less essential in peace flying. As a matter of fact it will have to become a part of the equipment of every mail and passenger aircraft, and much as we dislike a multiplication of regulations we are of the opinion that the sooner it is made compulsory the better. Air navigation must be made safe at all costs, and any practical aid to safety should be adopted sooner rather than later."

Armstrong Patent Sustained

THE appeal of the De Forest Radio Telephone and Telegraph Company against the decision of the United States District Court for Southern New York, which sustained the contention of Edwin H. Armstrong that the De Forest Company had infringed the famous feed-back patent No. 1,113,149, has been denied by the United States Circuit Court of Appeals, for the Second Circuit.

The decision, in part, was as follows:

"The patent in suit was granted for a wireless receiving system on October 6, 1914, and on an application filed October 29, 1913. There are twelve claims in suit. All are held to be infringed by the decree below. The invention relates to improvements in the arrangement and connections of the electrical apparatus and receiving station of a wireless system and particularly a system in which the so-called audion is used as the Hertzian wave detector, the object being to amplify the effect of the received waves upon the current in the telephone or receiving circuit, to increase the loudness and definition of the sounds in the telephone or other receiver, whereby more reliable communication may be established or a greater distance of the transmission becomes possible.

"The patentee, while a student of Columbia University, living in Yonkers, was an amateur wireless operator and had a station at his home. There he made observations which led him to suspect that the radio frequency oscillations might be carried over into the plate circuit with some improvements in the detecting action of the audion. He tuned the plate circuit to radio frequency by inserting in the plate circuit such inductance and capacity as to make it responsive to the radio frequency waves. Then he found not only that the radio frequency waves could be carried over into the plate circuit, but that they could be there amplified by the energy derived from the local battery in the plate circuit without change of frequency or wave form and that they could be fed into the grid circuit where they increased the potential variations on the grid and the operation continuously repeated itself, producing the feed-back regeneration which increased normally the sensitiveness of the device and the loudness of the receiving signals. It was in this way that he thought out his invention which has been a great advance in the wireless art.

"But it is sought to defeat the patentee by the claim of prior date of invention by DeForest and some patents in the prior art are also submitted as defenses.

"The testimony of DeForest has been offered in evidence by which it is attempted to show that he had conceived the invention in 1912 and 1913, and that he is, in point of fact, the prior inventor. The appellant offered in evidence DeForest's experimental note books, showing entries made under date of June 21, 1912, where there is the observation of a beat or high frequency note with a straight audion hook-up. The note shows this to have been transient and incapable of reproduction, and he recognized that it was not the true heterodyne effect. This was due to the gas action in the tube, an effect which has always been observed by users of the straight audion hook-up.

"On February 20, 1915, DeForest published in the "Electrical World" an article in which he made claims with respect to his early work on the oscillating audion and referred to two such experiments, the first of which he said occured in the latter part of 1910 or 1911, and the second on August 26, 1912. In these there is no mention of the feed-back circuit of the Van Etten August 6 entry, which it is now claimed represents his first real discovery of a controllable oscillating audion. These and other circumstances seem to us inconsistent with the idea that DeForest had any real knowledge of or understood the Van Etten accidental circuit arrangement of August 6, 1912. Nowhere in the notes which are in evidence is any reference made to the terms which would ordinarily be used if such a discovery were made and understood. The terms 'feedback' or 'regeneration,' 'input circuit' or 'output circuit' or 're-amplification,' are not found in the notes.

"We do not agree with the claim of the appellant that the patent is for a principle. It is for an instrumentality. It should be construed to cover the uses of the apparatus which are described and claimed. As the testimony of the expert called by the appellee indicates, the appellant's use infringes all of the claims of the patent in suit relied on.

"We think this excellent contribution to the wireless art should be accorded the full scope which the court below gave it in the decree. We think the decree is not too broad, but properly describes what the inventor conceived and for which protection must be accorded to him. Decree affirmed."

Amateurs Assist Associated Press in Emergency

THE snow storm which raged over the Northwest on February 22 and 23 played such havoc with telegraph and telephone lines that the Associated Press news service was badly crippled. According to the Minneapolis Tribune the emergency led that paper to organize its first wireless news service.

"With the aid of the University of Minnesota radio station, and a dozen wireless operators of the Twin Cities," states the Tribune, "The Tribune supplemented its halting wire service with radio bulletins."

When the Associated Press service was completely cut off early in the evening the University wireless station sent out an SOS for news and sought to get in touch with the Associated Press offices in Chicago. Response was prompt and eager. Amateur operators, anxious to help, sent in what news they could find and in a short time after the first call, bulletins had been received from Illinois and Indiana points. By midnight the Tribune had the news flashes from the navy station at Arlington.

At this stage of the game the amateurs of the Twin Cities extended their radio service to include points throughout the Northwest. The Tribune, as it received its bulletins, forwarded them to the Associated Press offices, and the amateurs forwarded the news to stations in the Northwest, which in their turn relayed to stations still further on. It was not only a great night for the amateurs—for they were given plenty of opportunity to work during daylight—but it was a time of emergency when radio came in for a thorough test. And radio did not fail.

EXPERIMENTERS' WORLD

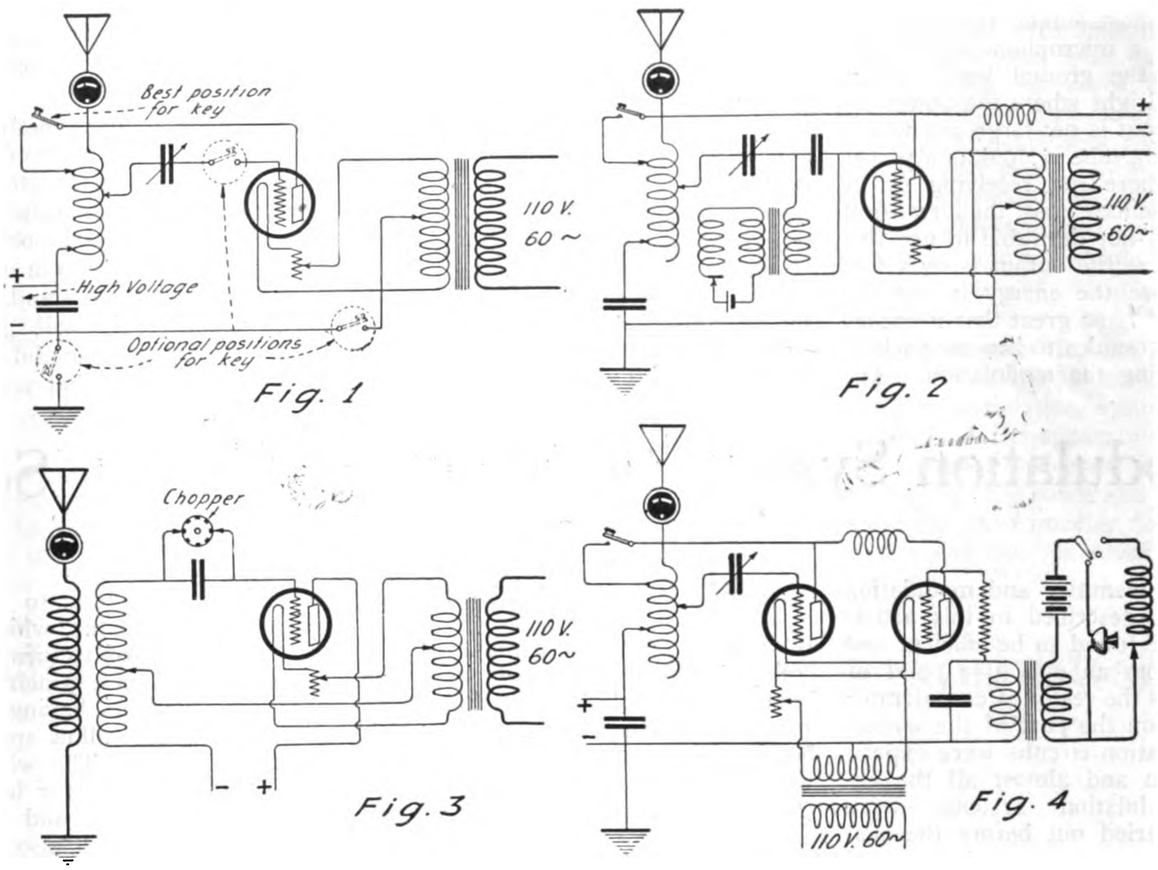
Views of readers on subjects and specific problems they would like to have discussed in this department will be appreciated by the Editor

Modulating the Output of Your C. W. Set

By Clara A. Phillips

FIRST PRIZE $10.00

"ONE — two — three — four — five — Hello! Hello! Hello! How's my modulation now?" That is what one hears almost every evening if they live in a locality that has a few radiophones. Radiophones are winning popularity owing to the ease with which they can be understood, but for a phone station to become popular it is necessary that its modulation be good. Perhaps the average amateur experiences so much difficulty in securing good modulation because there are so many different ways in which to modulate the output of the transmitting station.



Various modulating circuit diagrams

It is equally important to get good modulation with key as with voice, for a good note is as desirable as a good voice. The matter is somewhat simplified when modulating with a key as it may be inserted in a variety of places. If A.C. is to be used on the plates of the transmitting tubes, the key may be inserted in the primary lead of the high-voltage transformer, but if the high voltage is to be rectified it is not recommended that this method be used. Satisfactory results are obtained with the key inserted in filament center tap lead or in the grid lead. The key may also be inserted in the ground lead if the power output is not too great, but this is not recommended. The most satisfactory place to modulate the output of the transmitting station is in the inductance. Two or three turns of the inductance are shunted by the key. This method is best where a chopper is not used, as the tube is always oscillating and therefore gives out a smooth note, whereas if the key is placed in the primary lead of the high-voltage transformer the tube must build up each time the key is pressed and does not give a tone that is pleasing to read.

If the amateur wants to make his signals audible at a receiving station which employs a mineral detector some method must be used other than straight C.W. He has two methods, buzzer modulation and chopper, from which to choose. Buzzer modulation is the cheapest and is efficient if the buzzer can give a steady note when the key is elsewhere in the circuit. Figure 2 shows the circuit the writer has selected after trying the chopper and also the buzzer in the grid lead as shown in figure 3. The method shown in figure 3 is not very good as it is almost impossible to have the buzzer maintain a constant note when the key is pressed. Figure 4 shows the method in which the chopper is connected in the circuit. This method is considered the best by some, but I found it was too much of a drag on my battery. If the amateur has a small 110-volt A.C. motor, such as dentists use, a chopper may be made by fastening to the armature shaft a fibre or hard rubber disk four inches in diameter in which is set 12 brass or copper studs that are flush with the outside face. An old set of copper wire brushes, such as are used on small starting motors, make excellent brushes for the chopper. The key is connected as shown in the diagram.

If the amateur wishes voice modulation he has a variety of systems to choose from which perhaps is the very reason that he experiences so much trouble in getting good voice modulation. The most simple system is the insertion of a microphone of low resistance in the ground lead. This method is alright where the power input and output is not large and where an amplifying tube is used as a power tube, or where the receiving set is made to oscillate and thus transmit voice. It is not desirable to use this method where the output is over five watts because the energy in the antenna circuit is so great that it causes the carbon granules to become packed, thus distorting the modulation. Another form of this method is to shunt the microphone with a few turns of wire to act as a by-pass for some of the radiated energy. Still another method is known as the "Absorption Method." In this method the microphone absorbs part of the radiated energy and modulates it with voice. This is accomplished by making a single turn of heavy insulated wire around the inductance and connecting the microphone directly across the ends of the loop. These three methods are not very satisfactory as the energy lost in absorption is too great to insure efficient results.

By far the best method to use for voice modulation is the method which employs a modulation transformer, those put out by the various manufacturers being fine for this work. If the amateur desires to build his own modulation transformer, however, the following will give good results. The core is made up of Norway soft iron wires, one-half inch in diameter, securely bundled together by a small card-board tube. The primary is wound with 265 turns of No. 26 S.C.C. wire. The secondary is similar to the secondary of a ¼-inch spark-coil. If the amateur has several coils which he thinks might work as modulation transformers he can easily tell which is the best by connecting the phones across the secondary and connecting the microphone battery in the primary side and speaking directly into the microphone. It is important that the microphone be spoken directly into when modulating the voice over the air. The coil that gives the best modulation as determined by the clearness of the articulation and signal strength is the one to use. It might increase the radiation of the set by shunting a condenser across the terminals of the spark-coil modulation transformer but the modulation does not change.

The location of the modulation transformer depends upon the circuit employed. With tubes used as oscillators the best place for the modulation transformer is in the grid lead, though satisfactory results are obtained with it in the filament center tap lead. If one or more tubes are used as modulating tubes the transformer must be in the grid lead of the modulating tubes. While it is possible to modulate three or four tubes used as oscillators by one modulating tube, it is recommended that every oscillating tube have a companion modulator. I personally prefer this circuit as I have been able to get almost perfect modulation.

In order to get good modulation it is essential that the microphone work properly and too much attention cannot be given to this valuable instrument. It is not good policy to purchase an inferior make in order to reduce the cost as a standard microphone transformer will give better service and better modulation. And after all isn't that what we all want?

Modulation System for Moderate Power Sets

By K. Gitlitz

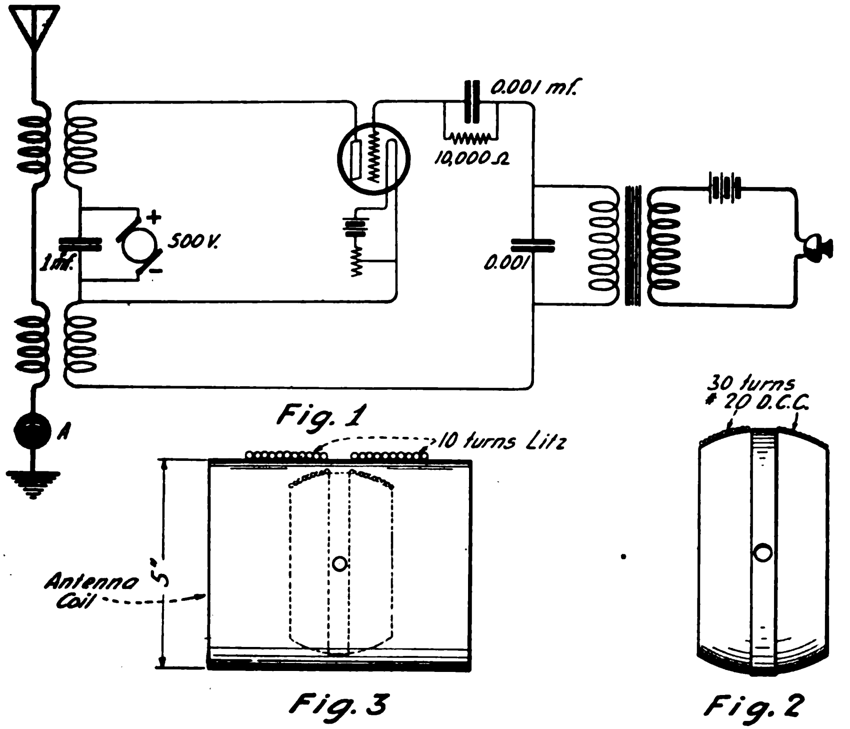
SECOND PRIZE $5.00

THE transmitter and modulation system described in this article will be found to be efficient and practical from an operative point of view, as it is the result of considerable experiment on the part of the writer. Many oscillation circuits were experimented with and almost all the accepted modulation systems were thoroughly tried out before the system here presented was finally selected as giving the best all around results on sets ranging in power from 5 watts to 25 watts. It is well known, for example, that some modulation systems which are satisfactory for low powers will not prove efficient on medium or high powers. This was specifically avoided, as I hoped to increase the power of the transmitter, and therefore wanted a modulator which could be adapted to all powers without much change.

Figure 1 shows the connections and circuit of the transmitter. The oscillation circuit is the series feed circuit in which the plate generator is directly in series with the plate and grid coils. The plate and grid coils are wound as a split coil on the same form, there being a space of ¼ inch between the two coils. The coils are wound on a 3-inch spherical variometer form made of wood, and there are 30 turns of No. 20 D.C.C. in each winding section shown in figure 2. In series with the two sections of the plate grid coil is connected a one micofarad telephone condenser which shunts the plate generator, thereby providing a by-pass for the radio-frequency current and so affording protection for the generator windings. The other end of the two coil sections go to the plate directly and to the grid through the grid condenser and leak. The grid condenser is .001 mfd. and the grid leak is 10,000 ohms; these values having been found to give best average results between the powers of 5 and 25 watts.

The plate and grid coils are coupled in variometer fashion to the output circuit in the antenna, which consists of two windings of 10 turns each connected in series on a 5-inch cylindrical tube; the windings having a separation of ¼ inch to allow space for the variometer shaft. The winding tube should be of dilecto for best results, but an impregnated and well-baked cardboard tubing will also give satisfactory results. Amateurs will find that unusually good results will be obtained if heavy litzendraht, which can be obtained at any radio store, is employed for the antenna coil. This coil is tapped at every three turns, allowing sufficiently fine adjustment for wave-length control. The coupling is adjusted by rotating the plate and grid coils. In tapping the litzendraht care should be taken that all the strands are carefully separated, the enamel scraped off well and all strands properly tinned, otherwise, a high resistance may be developed. Also when soldering no traces should be left on the tube or the panel, for otherwise leakage paths will develop and diminished output will result.

It was mentioned in a previous paragraph that various modulation systems were experimented with. The microphone was used in the antenna but unfavorable results were obtained when powers in excess of 10 watts had to be modulated. The Heising system of plate modulation was also tried, and this gave excellent results, but this circuit required extra modulator tubes, some accessories like radio frequency and audio-frequency choke coils, etc. It was therefore abandoned as I wanted to use all my tubes as power tubes and eliminate all possible accessories which might be dispensed with. The simple modulation of grid injection was tried and experimented with until with proper modifications in design good results were obtained over the power range mentioned at the start.



Circuit diagram of modulating system and coil windings

In this circuit the audio-frequency speech voltage is impressed directly on the grid of the oscillator. A low resistance microphone is employed and supplied with D.C. power from two or three dry cells in series. Connected in series with the microphone is the primary of the speech transformer. The secondary is connected in series with the grid oscillation coil, and is shunted by a .001 mfd. condenser to by-pass the radio frequency. Note well, that a condenser much higher in value should not be used to shunt the secondary, for it will have a low impedance to speech current and thus short circuit any speech voltage which may be developed across the secondary, and no modulation will be obtained.

Now the most important feature in the modulation system here described is the design of the speech transformer. If this is not properly designed poor and incomplete modulation will result. A Ford spark coil will give good results, but a transformer based on proper values for the primary inductance will give better results. This transformer has a ratio of 30 to 1. The core is made either of a bundle of iron wires having a diameter of 3/8 inch, or of sheet transformer iron stacked up to give a cross-section of 3/8 x 3/8 inch. The core is bound with linen tape or stiff paper and wound with 300 turns of No. 18 S.C.C. in about four layers. The primary is then bound with one thickness of heavy stiff paper such as oak tag, and wound with 9,000 turns of No. 30 enamel wire in about 28 layers. This will give sufficient secondary voltage to modulate the radio frequency output of the oscillator completely.

It will be seen that the circuits are simple and relatively inexpensive and that the modulation system requires extremely little apparatus. The results obtained will show that this circuit delivers the goods and will recompense the experimenter for the little trouble and labor involved in its construction.

Modulating Five-Watt Tube Transmitters

By Floyd Rittman

THIRD PRIZE $3.00

THERE are several ways to modulate the output of a 5-watt tube. Some are only slightly efficient, and can be used only when the current radiated is low. One way is to insert a telephone in the ground circuit of a transmitter. This will modulate the output only when a small amount of current is radiated, and even then the entire output of the transmitter is not modulated. The microphone must be especially constructed to carry a heavy current or it will pack after it has been in use only a short time.

Another method of modulation is that known as the absorption loop method, in which a few turns of wire, shunted by a telephone transmitter, is slipped over the inductance. When the telephone is spoken into the amount of current absorbed by the few turns of wire varies, thus impressing the speech upon the output of the transmitting set. The few turns of wire may be slipped back and forth upon the inductance until the point is found where the modulation is the best. This type of modulation is better than the one explained before, but like the former method, it can be used only on transmitting sets where the output is small. One thing to recommend it is the fact that it requires only a few turns of wire and a telephone transmitter.

In order to use the modulation loop on the set which I described in the February WIRELESS AGE, a change must be made in the inductance. One of the end supports must have a hole as near in size to the inside diameter of the inductance tube as possible. A piece of tubing large enough to slide through this hole loosely, is wound with a few turns of wire. The number of turns which works best must be determined by experiment. This tube is put inside the inductance, and the amount of current it will absorb

(Continued on page 68)

The Monthly Service Bulletin of the

NATIONAL AMATEUR WIRELESS ASSOCIATION

Guglielmo Marconi
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HEADQUARTERS: 326 BROADWAY, NEW YORK

THE New Haven Radio Association held a very successful meeting March 30, in the new permanent quarters of the club in Fraternal Hall, 19 Elm street. The occasion was the regular semi-monthly meeting of the club and the attendance was large despite the bad weather.

It was announced that the membership had grown to 126 and that probably by May the 200 mark will be reached. The club will continue its activities through the summer so that the new members may be instructed in wireless to the effect that next winter the more advanced details of radio transmission may be grasped.

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MARKED progress is being made at Mount Vernon, N. Y., in the organizing of a local radio organization, to be known as the Mount Vernon radio club, as a result of a meeting at the Y. M. C. A. In addition to the club to be open to all people in the city who are interested in radio, it is probable that there will be formed an organization for licensed amateurs and recognized radio students.

The latter organization will be made up of possibly thirty local exponents of radio who have spent several years in study and experiment and, judging from statements of several of the men who are interested in this latter organization one of its most important functions will be to assist the Mount Vernon Radio Club.

The members of the amateur club will probably offer to take part in discussions, offer papers and give any advise requested by members of the club regarding construction of receiving sets, tuning devices and the most advantageous manner of manipulating them.

The Mount Vernon Radio Club in the meantime will continue and will hold meetings at intervals. Efforts are being made to make arrangements for the securing of a receiving set by the club, when it is properly organized and with the assistance of the Amateur club, the first organization should be successful.

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AMATEURS and others interested in radio development are invited to attend the regular Friday night meetings of the San Francisco Radio Club at its headquarters, 173 Dolores street, San Francisco. The club invites visitors to its meetings with the exception of that held the first Friday in the month, when the session is devoted to club business.

The San Francisco Radio Club is the oldest of its kind in this part of the country, having been organized ten years ago. At 173 Dolores street it maintains large quarters, equipped with receiving and transmitting apparatus. Lectures and demonstrations are given, and the membership includes all grades from the beginner to the seasoned commercial radio operator.

At the head of the club are experienced radio men. The president is H. W. Dickow, managing editor of Radio; vice president, C. Thompson, radio engineer; secretary, Sidney J. Foss, a commercial operator who was in charge of radio stations during the war; treasurer, A Shoemaker, operator, and sergeant-at-arms, A. Burgess.

The San Francisco Radio Club was the first organization to suggest and foster the "Pacific plan," which has been a great help in broadcasting on this coast. Through its information department it has succeeded in putting a stop to transmitting by amateurs during concerts. Through its service the club "keeps the air clear" in this district, and amateurs who violate the rules are promptly reported.

Admiral Sir Henry B. Jackson presenting to W. E. Burne the first prize for English reception of American amateur trans-Atlantic radio messages

Secretary Foss was for some time the youngest radio operator in the country. He started when he was 15 to learn the mysteries of radio, and still is an enthusiast.

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THE officials of Richmond, Va., have adopted a set of rules covering the installation of amateur wireless stations, which provides that such installations must conform to the provisions of the National Electric Code.

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FINLEY DAVIS, West Second street, was elected president, Paul Scrimsher, Locust avenue, vice-president, and William Gess, East High street, secretary-treasurer of the Junior High School Radio Club, Lexington, Ky., at the organization meeting held March 29 at the school.

The club is composed of Junior high boys and alumni of the past term. The object of the club is to study the history, development and mechanism of the radio. Meetings are to be held bi-monthly. The club is under the supervision of Mrs. Charlotte Scott Dunkman.

△ △

THE Peninsula Radio Club held a very interesting meeting, March 19, in the army Y. M. C. A. at Fort Monroe, Va., when several matters were under discussion. Eleven members were present. It was announced that the demonstration by the club at Elks' Hall, March 16, was a success.

Major Coalton lectured before the club on April 1 on "Radio and Audio Frequency Amplification."

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A MEETING of the junior section of the Indiana Society of Radio Engineers was held April 29 in the Shortridge High School study hall, Indianapolis, Ind. The Indiana Society of Radio Engineers has approved the tentative broadcasting program of the Washington conference and plans were discussed at the meeting regarding the formation of an interference committee in Indianapolis which will deal with local interference problems, both amateur and commerical.

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A NOVEL feature of the big radio show to be held in the Seventy-first Regiment Armory, New York, from May 22 to May 29, inclusive, will be an exchange booth, where the radio amateur may trade his extra equipment with his brother fans. Plans which have just been completed for the show call for the active co-operation of the Signal Corps battalion which is located in the tower of the armory, and much Government material will be exhibited.

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ADVICES have been received from Pierre Corrot of Paris, editor of a leading French wireless magazine, that French amateur stations have recently heard messages from 1ARY, the University of Vermont station at Burlington, Vt.

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FORTY members of the Reading Radio Club of Reading, Pa., gathered at Sterling Lodge in Hill Crest on March 10, to celebrate the first anniversary of the club. A banquet, addresses and entertainment featured the evening.

Harold Landis, president of the club, presided at the banquet. On the speakers list were H. W. Rentschler and Edwin F. Deem, secretary of the P. & R. Y. M. C. A. The speakers reviewed the progress made by the club during the year and predicted that the next year will witness a phenomenal increase in its popularity.

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THE Norfolk, Va., Radio Club, which met on March 29, authorized the appointment of a committee to take charge of the organization's work. Those who want information about radio, or who need assistance in getting started have been asked to get in touch with the secretary of the club, 222 Brewer street.

The problem of interference of local radio operators with concerts from the north also was taken up, and steps will be taken to attempt to minimize that interference.

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CIVIL Service examinations for junior physicists to fill vacancies in the Bureau of Standards, Department of Commerce, Washington, D. C., will be held on July 5 and August 25, next. Intending applicants may secure full information and application blanks of the Civil Service Commission, Washington, D. C., or any local branch of the Commission. Applicants may be examined, at their request, on any of the following subjects: Radio, heat, electricity, mechanics, optics and physical metallurgy. The salaries of the positions to be filled range between $1,200 and $1,500 a year, with an additional bonus of $240 a year.

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SIXTY-EIGHT amateur operators met on March 9 at the Hotel Muehlebach, Kansas City, Mo., to organize the Radio Club of Greater Kansas City. Their first purpose is to appoint a regulator for amateur traffic and to establish a means of penalizing operators who cut in on concerts given at fixed intervals, by petitioning for a revocation of sending licenses.

The organization will be completed and officers will be chosen at a meeting to be held at the Hotel Muehlebach.

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AMONG the activities of the Roselle Park Radio Club, of Roselle Park, N. J., was a lecture by Paul F. Godley, which included a description of his experiences in Scotland and also the apparatus used in the tests.

On March 23, E. W. Tingley gave an interesting talk on "Amplifying Transformers and Condensers."

On February 24 last the club held a dance, the music for which was furnished entirely by radio from WJZ station.

The club is growing both in membership and activities. It was organized in October, 1920, with 15 members. The present membership is 72. The club will, in future, issue advance printed programs of its activities. Copies may be obtained from the secretary, C. A. Reberger, Roselle Park, N. J.

The lecture by Paul Godley was given in the High School Auditorium, Grant avenue, Roselle Park, at 8 P. M., Tuesday, May 9.. An Invitation was extended to all interested to attend this talk by Godley.

The officers of the Roselle Park Radio Club are: R. H. Horning, president, 2KK; G. Bosler, vice-president; C. A. Reberger, secretary; H. Ryder, treasurer; H. Luttgens, traffic manager, 2BCC; P. J. Larsen, technical adviser.

Δ Δ

Abreast Of The Times

By R. R. COATES

A GREAT many of the amateur radio enthusiasts of today do not readily sense the value, the absolute necessity in fact, of keeping in close touch with their hobby.

They visit the establishment of their respective dealers, make their purchases or inspect the various paraphernalia which make up the "wireless set" and go home satisfied that they have the best, or that they are familiar with the latest and best in the line. They purchase a copy of some radio periodical or magazine, read a few timely paragraphs and go to bed.

Little do they realize that every tiny "ad" or full page display has something of interest or some knowledge to impart to them. This is quite true. Every day brings something new into this vast new field. To have or to know the best and latest the amateur of today must be "up on his toes."

Not an issue of the various magazines devoted to radio should be missed. Not an advertisement within its covers should be overlooked. The various advertisers are quite glad to forward descriptive matter pertaining to their wares and explaining their respective merits; many of these containing the latest developments of the industry. It pays to write the advertisers. The open forums where hundreds of amateurs all over the country meet and tell of their experience and discoveries is another knowledge mart of exceptional value. A filing of these clippings and pages will be found one of the most valuable assets.

Radio holds a wonderful future, and—to those who wish to specialize—remunerative returns. One cannot afford to miss a single fact or detail. Read, experiment, study the discoveries of others, experiment and improve upon them, broadcast your findings; prove the arguments of others and you will soon find that you are improving at a tremendous rate.

The amateur who has constantly about him every obtainable book, catalog, clipping, folder or other descriptive matter devoted or pertaining to his hobby will be found the better versed and in consequence the most successful.

"COPPERWELD"
TRADE MARK REG. U. S. PAT. OFF.
ANTENNA WIRE
The Super-Strength Copper
50% Stronger Than Copper
Better than Solid Copper or Strands.
BUY IT IN CARTONS
At Your Dealers
100-FT. CARTONS - 200-FT. CARTONS
Cartons include directions for installing
COPPER CLAD STEEL COMPANY
Braddock P. O. Rankin, Pa.

Δ Δ

Radio BE-3
Third Signal Company
Camp Lewis, Wash.
April 2, 1922.

Editor, "Wireless Age,"

Dear Sir: I have read the N. A. W. A. item on page 42 of the March, 1922, issue of "THE WIRELESS AGE" concerning the reception of Dr. A. F. Banks' 15-watt C. W. transmitter at San Diego, by Mr. Dow, Wailuku, T. H.

I believe we can go Dr. Banks one better, as Mr. Dow reports signals QSA from this station, ex-SC-3. He did not mention the date, however, so have written him for further particulars.

We have been using a Signal Corps SCR-67-A phone set with one extra 5-watt oscillator, making a total of three VT-2's, with a key in the modulating circuit for plain C. W. work. We have a seven-wire antenna 75-feet long and 40 feet high of the inverted "L" type. Transmitting wavelength, 350 meters. Radiation, 1 to 1.6 amperes.

SHELBY J. BLONG,
Staff Sergt., Sig. Corps, in charge Radio BE3

Δ Δ

AT the first meeting following incorporation of the Executive Radio Council, Second District, which was held at the Radio Institute of America, 326 Broadway, on April 11, J. O. Smith declined another term as Chairman and was succeeded by R. H. McMann, who has been Vice-Chairman. The other officers elected are: Vice-Chairman A. A. Hebert; Corresponding Secretary, R. Hertzberg; Recording Secretary, B. B. Jackson; Treasurer, Joseph Stantley; Traffic Supervisor, F. B. Ostman.

Other business transacted included the adoption of bylaws and a final report of the convention committee, which showed that the net proceeds of the recent convention and exhibition were approximately $5,200. It was decided to hold the next annual convention and exhibition during the first week of March, 1923.

Prize Contest Announcement

The subject for the new prize contest of our year-round series is:

BROADCASTING RECEIVER FOR LOOP ANTENNA

CLOSING DATE :: :: JUNE 1, 1922

Contestants are requested to submit articles at the earliest practical date.

Prize winning articles will appear in the August, 1922 issue.

All manuscripts should be addressed to the CONTEST EDITOR OF THE WIRELESS AGE.

The increasing popularity of Radio Frequency Amplification is bringing constant demands for a receiving set employing a loop aerial which can be set up entirely indoors. Complete constructional details and wiring diagrams of this set will interest many of our readers. Radio Frequency Amplification is comparatively new so bring out all the little hints on this subject.

PRIZE CONTEST CONDITIONS—Manuscripts on the subject announced above are judged by the Editors of THE WIRELESS AGE from the viewpoint of the ingeniousness of the idea presented, its practicability and general utility, originality and clearness in description Literary ability is not needed, but neatness in manuscript and drawing is taken into account. Finished drawings are not required, sketches will do. Contest is open to everybody. The closing date is given in the above announcement. THE WIRELESS AGE will award the following prizes: First Prize, $10.00; Second Prize, $5.00; Third Prize, $3.00, *in addition to the regular space rate paid for technical articles.*

THE Woman's Radio League, of which Miss Abby P. Morrison is president, took an active part in radio affairs at the recent Travel Show in New York City.

The young women of the league set up a station and erected an antenna, all by 'emselves, and copied signals and messages from many stations in the eastern part of the country.

Miss Marianne Clayton Brown and Mrs. Eleanor G. Regan, both of whom are licensed operators, took down messages from distant points like professional operators for more than one hour.

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IN spite of the inclement weather the S. M. U. Radio Club of Dallas, Tex., held its first meeting March 29. A number of interested students were present in spite of the rainy weather. A receiving set, owned by Carl Feickert and Joe Terrell, was used to give an exhibition. The aerial was only a temporary construction and was not well insulated and the static constantly interfered, but the News and Journal bulletins were received.

The club decided to have a meeting each Wednesday night, and Mr. Feickert, president of the club, said that at the next meeting a crystal set would be brought and a special lecture would be given for the benefit of those not thoroughly versed in radio technique.

The set that was used by the club on March 29 picked up Denver, but due to the heavy static nothing could be heard for any sustained period.

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THE wireless telephone at the Shields High School laboratory at Seymour, Ind., was used for receiving the scores of the basketball games played on March 17 at Indianapolis in the state high school basketball tournament finals.

Mr. C. H. Phillips, instructor in physics and mathematics, has been using the outfit at the school building for some time. A musical program was put on at Indianapolis preceding the games and was heard by the entire class. Following this, the reports of the games were received.

Arthur Kaufman, one of the students, was selected to assist in the work of receiving the messages. The apparatus worked very satisfactorily and the use of the radio phone was both instructive and interesting to the students.

△ △

THE Philadelphia Amateur Radio Association held its bi-monthly meeting on April 3 in the Free Library Building, Broad street and Girard avenue, and heard the latest kinks in radio telephony and telegraphy.

The first speaker of the evening was W. C. MacFarland, employed in the daytime at the radio laboratory at the Philadelphia Navy Yard, who explained the difference between radio-frequency and audio-frequency.

The officers of the Philadelphia Amateur Radio Association are Gordon M. Christine, M. D., 3BF, president; John E. Delp, Jr., 3FD, vice president; W. Bradley Martin, 3QV, secretary-treasurer, and J. W. Forsyth, 3AWC, corresponding secretary. The business address of the association is 1927 North Twentieth street.

△ △

STUDENTS of the Central High Industrial School, 17th and Wood streets, Philadelphia, Pa., have formed a radio club which is one of the best equipped in the city.

The club is encouraged in its work by Professor Ralph P. Earle, head of the electrical construction department of the school. Robert G. Swift, 254 S. 9th street, is president of the club; Edmund Schell, 15th and Vine streets, vice-president, and Richard Wilson, 1702 Race street, secretary. The club was organized a year ago and now has thirty members.

△ △

WOULD-BE amateur wireless operators are declared to be responsible for thefts of receivers from public pay station telephone booths, in many cities of the East.

Reports of such thefts are being constantly received by the telephone companies.

Frequently, when out-of-order reports are received repair men sent to remedy the trouble find the phone minus the receiver, the wire attaching it to the instrument having been cut off.

The amateur operator who thinks, however, that he will be able to use successfully a pay station receiver in catching aerial messages will find himself mistaken.

The regular wireless receiver is wound to 1000-3000 ohms resistance, whereas the telephone booth receiver—the ordinary attachment on telephones, is wound to 75 ohms resistance. It is thus easy to understand how valueless a telephone receiver would be to an amateur wireless operator.

Filching of receivers from telephone instruments has become so extensive in Paris and other French cities that the French authorities have sent out a general alarm by circular warning station telephone operators to be on the lookout against this form of theft.

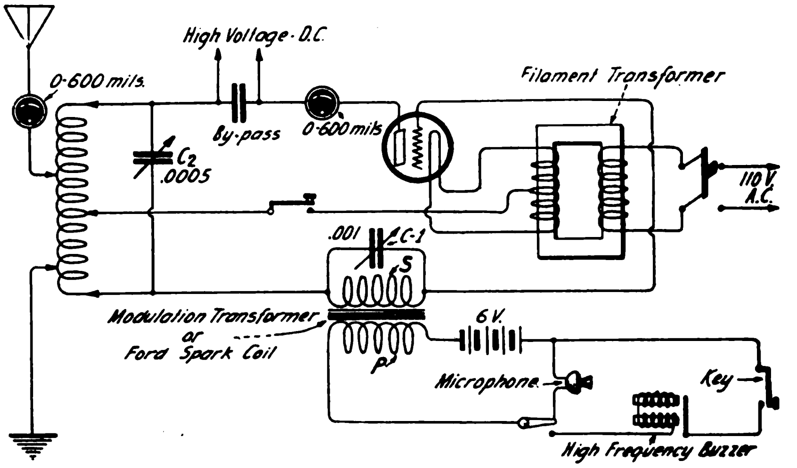
Modulating Five-Watt Tube Transmitters

(*Continued from page 65*)

regulated by sliding it back and forth. The modulation depends on the amount of current absorbed.

The best modulation of the output of a small phone set is obtained by using a modulation transformer in the grid circuit of the vacuum tube, as illustrated in the diagram. The secondary of the modulation transformer is connected between the grid of the tube and the grid tap on the inductance. A variable condenser of .001 mfd., is shunted across the secondary to help in tuning the modulation. This condenser is the main adjustment for modulation. A telephone transmitter and a six-volt battery are put in series with the primary of the modulation transformer.

To tune the transmitter for phone when using this type of modulation, set the condenser which is shunted across the modulation transformer (C-1) at full capacity; tune the transmitting set for best radiation on the wavelength desired; turn the condenser C-1 slowly to decrease its capacity. You will notice that the radiation will drop slowly at first, but soon a point will be reached where the radiation drops off abruptly. At a point just preceding this abrupt drop a point will be found where the modulation is the best. The extent to which the outgoing current is modulated may be determined by listening in on the receiving set while tuning for modulation. The phone should be heard plainly in the receivers.



Connections for modulating a five-watt tube transmitter

The radiation of the set on phone will not be as great as the radiation on straight C.W. To obviate retuning the set when phone is desired a single-pole single-throw knife switch across the secondary of the modulation transformer will short the secondary when C.W. is to be used.

Buzzer modulation may be used by substituting a buzzer for the telephone transmitter with a key and battery in series.

STATIONS WORKED AND HEARD

Stations worked should be enclosed in brackets. All monthly lists of distant stations worked and heard which are received by the 10th of each month will be published in the next month's issue. For example, lists received by November 10th will be published in the December issue. Spark and C. W. stations should be arranged in separate groups.

2BDX, R. BERNHARD, 135 Central Park West, New York City (February)

CW—1ff, 1in, 1iz, 1rd, 1uj, 1ze, 1awq, 1aqe, 1awb, 1auj, 1awl, 1ary, 1bqe, 1btl, 1bua, 1bkq, 1bdc, 1bdq, 1cik, 1cac, 1cod, (spk) 1aul, 3bp, 3bz, 3fo, 3fr, 3hg, 3hj, 3nb, 3rf, 3xm, 3zo, 3ajd, 3alm, 3aqh, 3aqw, 3aqr, 3agh, 3awg, 3apq, 3alu, 3aay, 3aff, 3bhl, 3blf, 3zab, (spk) 3pb, 4bg, 4dc, 4id, 4gu, 5an, 5fv, 8ao, 8bd, 8bb, 8bk, 8ci, 8dr, 8gl, 8gv, 8kr, 8lw, 8ok, 8os, 8pr, 8px, 8qy, 8sp, 8xv, 8awp, 8aqn, 8anz, 8aim, 8adg, 8awy, 8azh, 8alv, 8aoa, 8avo, 8anr, 8anw, 8awm, 8axc, 8alb, 8aoo, 8bun, 8bae, 8bne, 8bdu, 8bld, 8bnj, 8box, 8bil, 8bxh, 8bno. 8bbu, 8bbk, 8biz, 8bum, 8bnj, 8bny, 8bdu, 8cgx, 8cqm, 8kaz, (additional(8uk, 8bdu, 8cgx, 8cqm, 8kaz, 8uk, 8ym, 8se, 8wy, 8cfp, 9dp, 9dx, 9io, 9ou, 9kp, 9alo, 9aiv, 9aay, 9brl, 9iiv, wdy, wjz, kdka, nzo, dr.

Spark—8acf, 8agz, 8akg, 8afg, 8apb, 8adn, 8ceh, 8ixq.

2BYA, BURTON T. VAIL, 172 Loraine Ave., Schenectady, N. Y. (March)

Spark—1aa, 1adl, 1aje, 1apx, 1ary, 1av, 1aw, 1avr, 1bfz, 1bjs, 1brq, 1bwl, 1cok, 1dz, 1fr, 1gm, 1lz, 1ru, 1rv, 1sm, 1sw, 1wq, 2abm, 2aje, 2anm, 2awf, 2bk, 2blw, 2bm, 2byg, 2chw, 2cie, 2el, 2gx, 2om, 2pv, 2rm, 2sz, 2ts, 3abb, 3ajd, 3arm, 3arn, 3fb,, 3fd, 3hj, 3ok, 3qw, 3ud, 3ux, 3vw, 3xm, 3zo, 4bx, 4ea, 8aav, 8acf, 8afa, 8afb, 8afg, 8ahh, 8ahs, 8aiw, 8apb, 8ark, 8axo, 8bco, 8baz, 8cx, 8ew, 8od, 8sp, 8xe, 9ox, 9uh, 9zj.

CW—1adl, 1afv, 1ajf, 1ajp, 1amq, 1apj, 1ark, 1ary, 1avr, 1asf, 1azw, 1bas, 1bcf, 1bdc, 1bea, 1bep, 1bgf, 1bkr, 1bkq, 1ble, 1brq, 1bqe, 1sd, 1bsg, 1bua, 1bwj, 1cak, 1can, 1cgg, 1cgs, 1cik, 1cit, 1cjh, 1cjz, 1cln, 1cod, 1cpq, 1fb, 1ii, 1on, 1qp, 1pt, 1rd, 1rh, 1rr, 1ts, 1uj, 1un, 1xae fone, 1xm, 1ze, 2aab, 2abq, 2adp, 2agd, 2agv, 2aar, 2adv, 2ajf, 2ajr, 2ako, 2arz, 2auu, 2awj, 2awl, 2aws, 2azz, 2ba, 2bak, 2bcf, 2bea, 2beh, 2bem, 2bg, 2bgz, 2bml, 2bnd, 2bnz, 2bqi, 2bqw, 2brb, 2brc 2btj, 2ccd, 2ccu, 2cfm, 2cgq, 2czs, 2fz, 2ig, 2jj, 2lp, 2of, 2pz, 2rd, 2rp, 2sq, 2va, 2xi fone, 2xj fone, 2vh, 2zk, 2zo, 2zs, 3aad, 3aag, 3aay, 3adt, 3ady, 3aig, 3ajd, 3aln, 3anq, 3any, 3apd, 3ark, 3aqh, 3aqr, 3as, 3azo, 3bag, 3bec, 3bfq, 3bhl, 3biy, 3bg, 3bnu, 3bp, 3brw, 3bof, 3btk, 3bul, 3bur, 3by, 3bz, 3ca, 3cc, 3cg, 3ctz, 3dm, 3fb, 3fr, 3fs, 3gn, 3hb, 3hd, 3hx, 3il, 3iz, 3lh, 3lr, 3rc, 3qz, 3sm, 3ty, 3vw, 3zo, 3zw, 3zy, 4bf, 4byq, 4by, 4cc, 4dc, 4ds, 4eh, 4ft, 4gl, 4gx, 4id, 4ii, 4lp, 4xd, 5an, 5bn, 5fv, 5kp, 5nz, 5uu, 5za, 8acf, 8ago, 8agz, 8aim, 8anj, 8amm, 8aoa, 8aqf, 8aqv, 8aqz, 8aoo, 8ard, 8aru, 8awm, 8awp, 8awz, 8ax, 8axc, 8axk, 8baz, 8bd, 8bdk, 8bdu, 8bcl, 8bds, 8bef, 8bfx, 8bil, 8blt, 8bnj, 8box, 8brc, 8brl, 8bu, 8bur, 8bvk, 8bss, 8bxa, 8by, 8bz, 8bza, 8bzc, 8bzh, 8caz, 8cbj, 8cgy, 8ckm, 8cko, 8cns, 8dv, 8ge, 8ib, 8iq, 8jl, 8js, 8ju, 8lw, 8os, 8pc, 8rz, 8qd, 8sp, 8tb, 8tf, 8uk, 8vq, 8vy, 8pt, 8wr, 8xv, 8ze, 9aap, 9aau, 9aay, 9akd, 9anc, 9anf, 9apb, 9ark, 9ass, 9blo, 9brl, 9bsg, 9dyn, 9io, 9kp, 9lq, Can. 9al.

3AP, J. MARTIN SIMONS, 2316 N. 19th St., Philadelphia, Pa. (February)

3bll, (3awn), 3ann, 3po, 3jh, 3ob, 3bum, 3dis, (3hj), (3bp), 3bg, 3zq, 3anj, 3any, 3bdm, 3aeq, 3ajk, 3abo, 3bfu, 3bdi, 3bj, 3nw, 3gf, (3ud), 3za, 3bzi, 3gf, 3bo, 3bk, 3qn, 3li, 3aqr, 3bhw, 3azh, 3ahk, (3us), 3em, 3cg, 3iw, (3rw), (3amw), (3asy), 3uo, 3fr, 3la, 3asc, (3als), (3iz), 4dg, (4ea), 4ga, 4eu, 4bn, 4et, 4gl.

1btf, 1byf, 1bro, (1pe), 1afv, 1gm, 1ru. 1azk, 1md, 1aw, 1hk, 1qa, 1bvb, 1asf, 2awl, 2aak, 2ayz, 2dk, 2dn, 2ts, 5xa, 5kd, 5kj, 8go,

(*Continued on page 72*)

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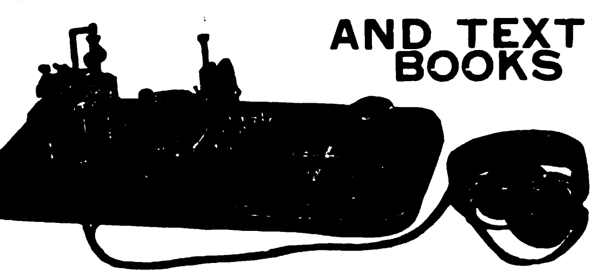

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The quickest, easiest way of learning radio reception — both telephony and telegraphy—is by means of the Aeriola Jr. Once installed, only two adjustments are required. The set is complete in itself and includes a variable tuner, a fixed condenser, a supersensitive crystal detector and head-telephones, and antenna outfit. Full instructions for installing and operating are provided. The Aeriola Jr. is good for receiving broadcasted signals, music, speeches, etc. from nearby stations. It can be tuned within a range of 190 to 500 meters wavelength. Price $32.50.

The Aeriola Sr.

Like the Aeriola Jr. the Aeriola Sr. is designed to meet the requirements of novices and beginners who have no technical knowledge of radio, but who wish to "listen in" and enjoy broadcasted music, sporting news, speeches, etc. It has a longer range than Aeriola Jr. It has features found only in more expensive apparatus, such as the Armstrong regenerative circuit to increase the strength of reception, and a vacuum tube detector. The set includes also a pair of head-telephones, a filament and a plate dry battery, and antenna outfit. Full instructions for installing and operating are sent with the set. Price $75.

As from a Phonograph

The whole family can now listen to broadcasted concerts, news, sermons and lectures with the Vocarola. The music and the words come out of a horn, just as they do from a phonograph. Any member of the family can operate it. The Vocarola consists simply of a horn which is mounted on the wall or any other suitable place and which contains a special, loud-speaking receiver unit capable of reproducing music and speech without distortion. It is connected, in the regular manner, with the amplifier of the radio set by means of a cord, which has only to be plugged in. Price $30.

Any Novice Can Do It

Radio is now within the reach of everybody. No longer is it necessary to be an expert. The radio telephone receiving set is as simple as the phonograph. Plug in a telephone jack, turn a tuning knob, and anybody can listen to concert music, speeches, lectures, news and sermons broadcasted by one of the many stations that now make it a daily and nightly business to entertain and instruct hundreds who own receiving sets. The ether is literally alive, these days, with songs of great artists, the voices of great orators and preachers, the news of the great events on which the destinies of nations hang. And, most wonderful of all, the ether can be tapped by anybody, with the receiving sets described and illustrated on these two pages.

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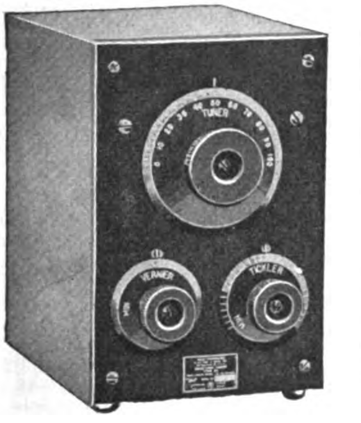
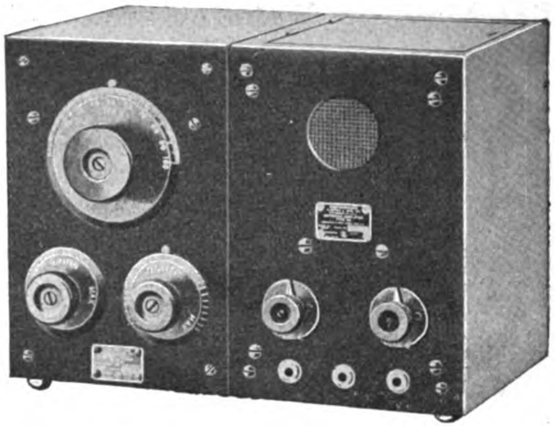


Type R A Short-Wave Regenerative Tuner

Most novices begin with crystal detection and later use vacuum tubes. With this unit they can change from crystals to tubes. Only one adjustment is required to tune in the desired signal. The device responds to any wave length between 180 and 700 meters simply by turning a knob. An adjustable tickler coil permits the use of regenerative amplification with a vacuum tube detector unit (Type DA). This tuner can also be used with Type DB Crystal Detector. Hence the novice can begin with crystal detection and later use tubes and amplifiers with this unit. A fine tuning adjustment is provided by a single-plate condenser for tuning in "CW" stations, or for receiving broadcasted music, news, etc. Price $68.

Type D A Tube Detector and Two-Stage Amplifier

This unit enables the novice to pass from crystal to tube detection easily and naturally. It gives him a vacuum tube detector and two stages of audio frequency amplification. Filaments are controlled by two rheostats, one of which regulates the current to the detector tube and the other the current to the two amplifying tubes. Signals may be received either without amplification, with one stage, or with two stages of amplification merely by inserting a telephone plug in the proper jack. The unit should be used with Radiotrons UV-200 as a detector and UV-201 as amplifiers, although UV-201 may be used throughout. Price (less Radiotron tubes and telephone plug) $70.



Type R C Short-Wave Regenerative Receiver

This receiver combines in one cabinet Type RA Short-Wave Regenerative Tuner and Type DA Detector and Two-Stage Amplifier, described elsewhere on this page. Hence it meets the requirements of the novice or broadcasting enthusiast who wants a modern, compact, portable, efficient receiver which will enable him to hear distant stations. This is an ideal instrument for use with the loud-speaking Vocarola. Messages may be received with the detector alone or with one or two stage amplification. Used with a load-coil (Type CB) signals can be received on wave lengths up to 1,600 or 2,800 meters, depending on the antenna. Price (less Radiotron tubes) $132.50. Type CB Load-Coil can be supplied for $6.

There's News and Music in the Air

Some of the sets like the Aeriola Jr. and the Aeriola Sr. are so simple that even one who has no knowledge of electricity whatever can set them up and "listen in" to the messages and music sent by broadcasting stations or by enthusiastic radio novices. Other, more sensitive sets, described and illustrated on this page, can be operated after a few hours' experience. By connecting a Vocarola loud-speaker with the more efficient sets shown *the whole family* can "listen in."

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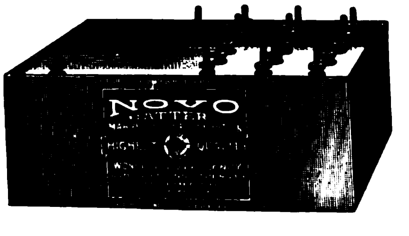

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Stations Worked and Heard

(*Continued from page 69*)

8fn, 8bq, (8xd), 8qr, (8afz), 8bto, 8wo, 8bva, 8ft, 8bum, 8ii, 8zg, 9aja, 9amt, 9akc, (9ak), (9uu), 9cp, 9ajh, 9aaw, 9agr, 9awx, 9dbe.

Fones—(3adt), (3and), (3aqa), (3awi), (3bjg), (3aku), (3rw), 3alw, (3anu), (3aae), (3ms), 3ar, (3fs), (3ds), (3amw), (3fm), 3gb, 3uo, (3zo), 4gl, 8ii.

Canadian—3jl, 3bp, xfl.

8BXX, HOMER FORSCHNER, 7 Ford Ave., Norwalk, Ohio (March)

Spark—(2wb), 3arn, 3dm, (4ea), (4ez), 4gn, 5hk, 5oi, 8amz, 8ang, 8axc, 8axn, (8ayx), (8baz), 8bdy, 8boi, 8bvk, 8ft, (8jj), (8ty), (8uc), 8vh, (8wd), 8xa, 8xe, 9aaw, 9acn, (9afk), (9agr), 9ahz, 9ajb, (9ajh), 9amq, (9amt), 9anp, (9aqm), 9atn, (9ava), 9avp, (9awz), 9ays, (9aze), (9azf), (9bdc), 9bgh, 9bp, (9cs), (9deh), (9dgw), 9dio, 9dso, 9dzy, 9ev, (9fk), 9ki, 9lf, 9to, (9vl), Canadian 3bp.

CW—(1bkq), (1bqe), 1xm, (2eh), 2fp, 3bfu, 3bn, 4eh, 4ft, 4zc, 5do, 6xad, 8ago, 8aio, 8alt, 8awm, (8bmf), 8brl, 8cbj, 8cgy, (8co), 8jz, 8oz, (8xe), 9ajh, 9ate, (9aua), 9awb, 9brl, 9dky, 9il, (9qe), 9zl, Can., 3bp fone.

8ZAC, CLIFFORD H. GALLOWAY, Barnesville, Ohio (March)

Spark—1ary, (1bdt), 1bgf, 1bkq, (1cz), 2aje, 2awf, 2by, 2om, (2wb), 2xk, (3ac), 3ajd, 3apa, 3arm, 3arn, 3auw, 3bjt, 3fb, (3hj), 3nb, 3pb, (3ta), (3ux), 3yb, 4as, 4be, 4bi, 4bq, (4cx), 4ea, 5aa, 5ew, 5gi, 5hk, 5jd, 5kc, 5sm, 5xa, 5xb, 5xu, 5zaa, 5zab, 7zm, 9aap, 9aaw, 9agq, (9agr), 9aig, 9amq, 9amt, 9anp, 9anq, 9arg, 9ask, 9avx, 9awz, 9aza, 9bp, 9dmj, 9drn, (9dso), 9dzi, 9ev, 9io, 9ki, 9lf, 9ms, (9ox), 9rc, 9uu, 9vl, 9wt, 9xi, 9xm, 9yo, 9zj, Canadian 3bp, 3cp, 3ea, (3ei), 3fo, (3gn).

CW—1ary, 1bgf, 2bea, 2bml, 2fp, 2nz, (3aln), 3aqr, 3bfu, 3zy, 3zz, 4by, (4ft), 5jb, 5uu, 5za, 5zak, (6xad), 6zg, 6zz, 9aja, 9akr, 9ari, 9dws, 9ei, 9fm, 9qe, 9xi, 9zaf.

ROBERT SCHNEIDER, Springfield, Ohio (March)

CW—1ajp, 1ary, 1bcg, 1bgf, 2ajm, 2apd, 2ba, 2bea, 2beb, 2bnz, 2ccd, 2zk, 3aaz, 3aqr, 3bhl, 3ca, 3cc, 3fs, 3gl, 3il, 4as, 4bf, 4bq, 4bz, 4dc, 4du, 4gl, 4ii, 4by, 5ek, 5za, 8abv, 8acf, 8agj, 8ago, 8agp, 8ahh, 8ahs, 8ahr, 8aim, 8ain, 8aio, 8ajt, 8ajx, 8akc, 8akf, 8alf, 8alt, 8aqh, 8aqv, 8apf, 8ark, 8arl, 8avh, 8awn, 8axn, 8azh, 8bcl, 8bdb, 8bdo (fone), ,8bex, 8bdu, 8bfx, 8bii, 8bjb, 8bk, 8bl, 8blm, 8blw, 8box, 8brl, 8btb, 8bu, 8byd, 8bzf, 8bzj (fone), 8bzy, 8cay, 8caz, 8cfd, 8cfs, 8cgl, 8cia, 8cko, 8cl, 8cld (fone), 8cua, 8cuc, 8dl, 8ge, 8gp, 8ii, 8iv, 8jm, 8kl, 8mp, 8oz, 8pc, 8qz, 8sp, 8uk, 8vj, 8vy, 8wi, 8xae, 8xak(fone), 8xc, 8yn(fone), 8za, 8zz, 9aap, 9aaw, 9ad, 9ago, 9aiv, 9akd, 9amo, 9ara, 9ark, 9aps, 9ayw, 9bfx, 9blo, 9brl, 9cfx, 9dun, 9dv, 9dyn, 9fc, 9if, 9io, 9lg, 9lq, 9pf, 9qe, 9qd, 9kt, (fone), 9uh, 9vx, 9zl, 9zq. Fones: Kdka, kof, kyw, wdy, wfj, wfo, wgy, wjz, wlk, wlw, wmh, wrk, wsh, wwj, wyd.

Spark—1adl, 1oon, 3aqr, 5al, 5da, 5hk, 8acb, 8ad, 8afd, 8afh, 8ah, 8aib, 8aiz, 8ajx, 8ajb, 8ano, 8aqm, 8ars, 8ar, 8atu, 8awu, 8axy, 8ayn, 8bbu, 8ben, 8bfi, 8blk, 8blw, 8bna, 8bu, 8by, 8cb, 8cdu, 8cfs, 8cnr, 8cgz, 8ctu, 8eb, 8ft, 8hf, 8hr, 8kh, 8od, 8rl, 8sp, 8uc, 8yn, 8yu, 8za, 8zaa, 9aaw, 9abr, 9acb, 9acn, 9agl, 9ain, 9air, 9amq, 9ams, 9amt, 9ano, 9aoj, 9apm, 9apv, 9aqm, 9asj, 9ask, 9atn, 9aza, 9azf, 9azh, 9bfx, 9by, 9bmn, 9cy, 9dcv, 9dgx, 9fd, 9ki, 9lf, 9mc, 9uh, 9vl 9yae, 9yq, 9zi, 9zj, 9zn.

Queries Answered

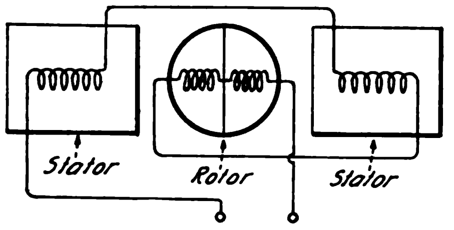
ANSWERS will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of one reader can be answered in the same issue. To receive attention these rules must be rigidly observed.

Positively no questions answered by mail.

E. F. S., Baltimore, Md.

Q. 1. One page 46 in "Practical Amateur Wireless Stations," Chapter XX, are directions for constructing variometers which I have carefully followed out, but I am at a loss to know just how to make the internal connections. There are four wire ends on the rotor and four on the stator. Now would you be so obliging as to draw in the connections on this diagram.

Ans. 1. Connect so that the current will pass through the two cells in the same direction as per diagram below so that it will not double lock upon itself.



Q. 2. Do grid and plate variometers connect alike.

Ans. 2. Grid and plate variometers are identical.

J. C. B., Candley, Pa.

Q.1. I am anxious to secure some information on the subject of sending messages under ground. This is a matter still in its infancy and it is hard to get ideas on the subject. I wish to experiment on same. Messages can easily be received from the ground which have been sent through the air, but what I have in mind is the method of sending under the ground with aerials.. Hope you have some books, or can tell me where I could procure same.

Ans. 1. Subject matter on this has not been published for general consumption, although articles have appeared in the radio magazines from time to time.

L. E., Rice, Kansas.

Q. 1. Are the slider rods on the tuning coil made of wood or metal?

Ans. 1. Metal.

Q. 2. If they are made of metal, what kind of metal must I use?

Ans. 2. Preferably brass.

Q. 3. What would be the size of aerial for this size set?

Ans. 3. One wire No. 14 copper bare about 100 to 150 feet long.

Q. 4. What kind of a phone should I use?

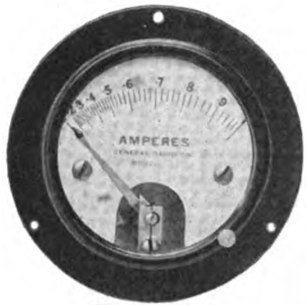
Ans. 4. A pair of 2000 ohms resistance of standard make.

F. L. G., Jamaica Plain, Mass.

Q. 1. I am very much interested in an article on page 38 of your March issue. I fail at present to see how one can get the required windings for coils within the space provided.

Ans. 1. See complete description of above article in April issue.

RADIO FREQUENCY AMMETERS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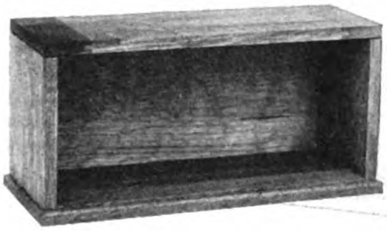

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E. L. M., Fairbault, Minn.

Q. 1. I wish to know how I can obtain the complete plans of the three-circuit receiving sets, that is, the correct method of making the coils, their size, the size wire, etc., also the distance it will receive.

Ans. 1. Many books contain the data you require. Suggest you get "Practical Amateur Wireless Stations" or "Wireless Experimenters' Manual," from Wireless Press, 326 Broadway, New York, or your local dealer.

E. K. M., Cleveland, Ohio.

Q. 1. On page 38, of The Wireless Age, for March, 1922, I notice an article entitled "Filament and Plate Current Direct from A. C. Supply." I wish to ask a few questions relative to same. Can this "stunt" be successfully used in connection with a three circuit regenerative receiving set?

Ans. 1. Yes, see April issue of The Wireless Age for additional information.

Q. 2. I also note that in the text of this article, in describing the construction of the transformer used, it states in part as follows: Secondary (high voltage) consists of 320 turns of No. 3 D. C. C." I feel that there must be an error regarding the size of the wire. Kindly state what size is meant.

Ans. 2. The correct size of wire is No. 32 D. C. C.

Q. 3. Also in giving dimensions of the transformer core, the article states: "Core: 4x5x1 inches." Do I understand that the 1 inch means the width of the core laminations or the height to which the core is built?

Ans. 3. You are correct; the width of each strip is one inch, also build up core to about one inch.

L. L., Elmira Heights, N. Y.
C. L. H., Westhaven, Conn.
H. A. J. C., Albany, N. Y.

All request information on Mr. Graff's article, page 38, March issue of The Wireless Age.

Ans. See additional information and descriptive matter in April issue of The Wireless Age.

V. C., Youngstown, Ohio

Q. 1. You recently gave a diagram for short wave reception, a copy of which is enclosed herewith. Is this known as the Armstrong?

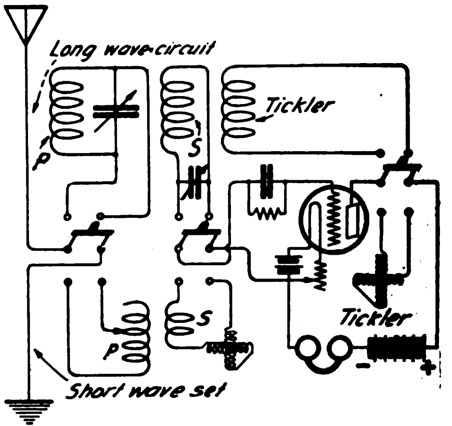
Ans. 1. Yes.

Q. 2. Using a regenerative receiver for wave lengths up to 600 meters, would the inductance unit shown herein be satisfactory for wave lengths from 600 to 15,000 meters (the advertised range), or would you advise the use of three separate coils on a three-coil mounting.

Ans. 2. Advise use of three coils on a three-coil mounting for best results. Three coils as shown would be O. K.

Q. 3. Will you please give me the proper connections for a set using the variocoupler, variometer method for short waves, and the honeycomb coil method for wave lengths from 600 to 15,000 meters, either by changing the phone plugs, or switches, or a combination?

Ans. 3. Here is your diagram.



Q. 4. Will this set receive from both damped and undamped stations? It is not clear to me what determines this. Is it the kind of detector, the type of tuning instruments, or what?

Ans. 4. Crystal will only receive damped and interrupted continuous waves. Vacuum tubes will receive damped and undamped waves. The vacuum tube is more desirable as stronger signals and greater distances are obtained from its use.

Q. 5. With approximately what degree of sensitivity is the C-300 superior to the crystal detector?

Ans. 5. Crystals and tubes vary in sensitiveness. As a general rule the vacuum tube is many times more sensitive than any crystal known so far.

Q. 6. My antenna will be approximately 80 feet long and 45 feet high, composed of four wire 2 feet apart. I wish to receive from nearly all of the coast stations and some ships—also broadcasting stations WJZ and KYW, using no amplification. Do you think I am expecting too much?

Ans. 6. You will probably be able to receive these stations O. K.. Weather conditions will play an important part, so it is rather uncertain.

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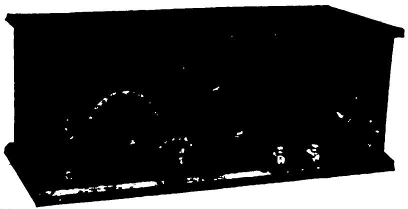

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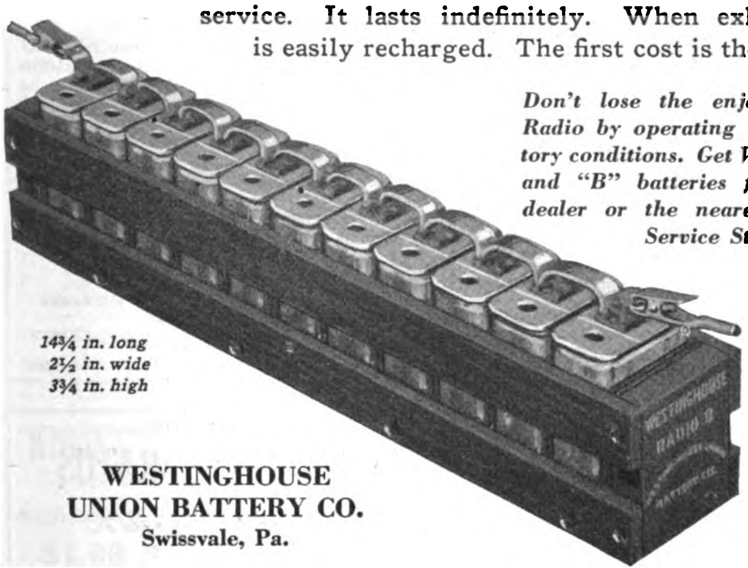

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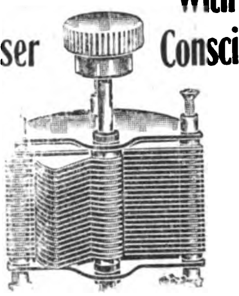

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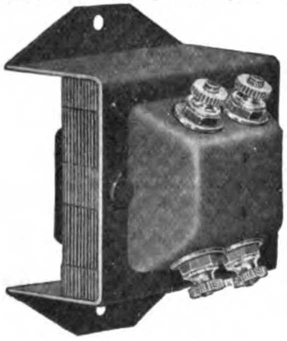

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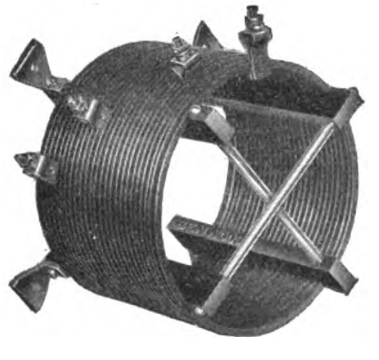

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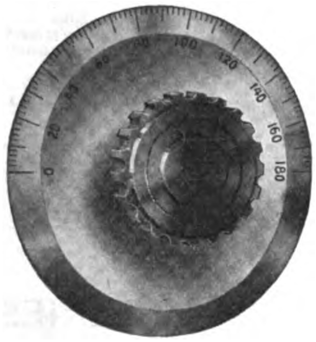

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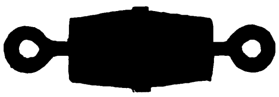

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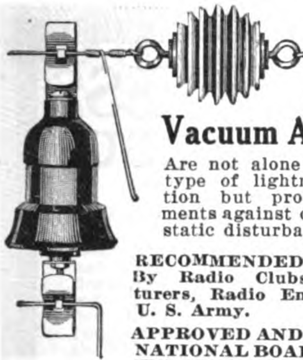

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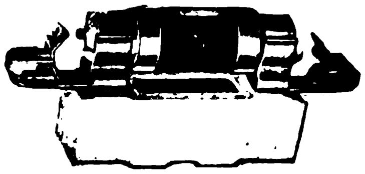

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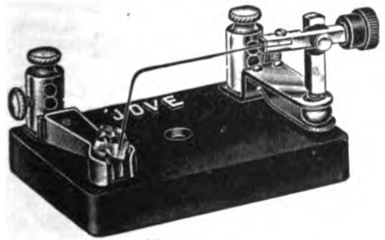

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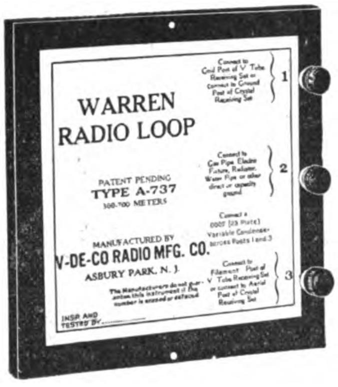
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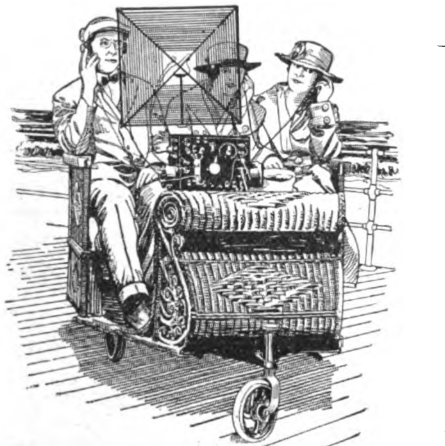

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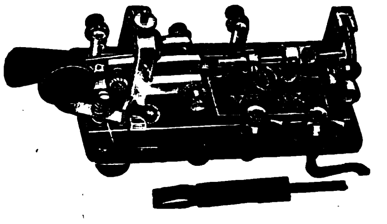

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The HOMCHARGER connects to any alternating current socket, gives a taper charge—will fully charge any "A" battery overnight. It is self-polarizing. Connect your battery either way and it will always charge. Automatically disconnects battery when power is interrupted. Restarts charging when connections are restored. Adjustable for wave form, frequency and voltage. Contains only one moving and two wearing parts, lasting thousands of hours, replaceable as a unit for $1.00. The highest charging rate, greatest efficiency, and simplest of any rectifier selling for less than $100.00. Bulletin 628 proves it. Ask for your copy. Manufactured in sizes for charging three or six cell batteries from both alternating and direct current circuits. Cannot injure battery—will last a lifetime—approved by underwriters — satisfaction guaranteed. For sale by all radio, electrical and accessory dealers or shipped express prepaid for purchase price—$18.50 ($20 west of Rockies).

Attention Motorists

Send for special Bulletin 58 showing how easy it is to 'Homcharge' your battery.

The AUTOMATIC ELECTRICAL DEVICES CO.
119 West Third St., Cincinnati, Ohio
Canadian Distributors—Powley & Moody, Ltd., Toronto

THE BEST LOUD SPEAKER IS YOUR *Phonograph* when used with the *"Easy"*

Radio-Phonograph Connector

Just slip the sound box (reproducer) off your talking machine and replace it with the "Easy" Connector. Then your head phone will fit the connector perfectly. Phonograph horns are scientifically made to give the greatest possible amplification.

Your complete receiving outfit can be placed in the record compartment of your phonograph. Then your RADIO apparatus becomes a beautiful piece of furniture instead of an unsightly conglomeration of parts—*does not in any way harm the phonograph for playing records.*

No. 2 Model, now ready, fits all Victor Phonographs and Victrolas, and all other machines with tone arm same size as Victor. Sent anywhere postpaid for **$1.50**

DEALERS: Radio and phonograph dealers are making big money on the rapid sale of this item. Every phonograph owner is a sure buyer. The discounts are attractive. Deliveries almost immediate. Orders filled in rotation.

BOYD FULLER & CO., 8452 Grand River Ave., Detroit, Mich.

You Must Have Good Batteries On Your Radio Set

HUNDREDS of thousands of people now have Radio Sets in their homes.

Many of these people have been disappointed in their Radio Set on account of the storage battery failing to function properly.

The Radio Set is as efficient as the Battery is good, and a good Battery costs no more than the many cheaply constructed batteries now being sold to the Radio operator.

Universal Batteries are built with heavy plates and separators insuring long life and uninterrupted service.

Don't take any chances—be sure that your set brings the messages to you loudly and clearly. This depends largely on the Batteries you use.

Right here is where Universal Batteries play an important part.

No matter where you buy your Radio Set or what price you pay, don't fail to use Universal Batteries.

Prices given below.

If your dealer cannot supply Universal Batteries—order direct. You'll never be sorry.

UNIVERSAL BATTERIES ALSO FURNISHED IN SEALED GLASS CELLS—Write for Bulletin 82

Universal Battery Co.
3444 So. La Salle St.,
CHICAGO, ILL.

BATTERIES FOR ALL KINDS OF WORK

TYPE WR

WR	60 Amp	$15.00
WR	85 Amp	17.50
WR	105 Amp	21.00

TYPE RR

RR	60 Amp	$19.00
RR	85 Amp	21.00
RR	105 Amp	25.50

Jobbers and Dealers Wanted to Handle Our Radio Line

UNIVERSAL Batteries

Edison

RADIO BATTERIES

Operators and experimenters who demand the best radio equipment obtainable can now have *EDISON BATTERIES* built of the same materials as the thousands performing so satisfactorily in the service of the ARMY and NAVY.

Edison Radio Batteries are built of steel and have an alkaline electrolyte. They are strong, clean, long-lived and have exclusive electrical features that are highly desirable in radio service.

THE EDISON RADIO CELL OPERATES SILENTLY. The voltage curve is flat, at the rate generally used. The terminals are convenient for "tapping in."

for filament circuits:

6 volts,	37.5 ampere hours	- -	**$42.50**
6 "	75 " "	- -	**58.75**
6 "	112.5 " "	- -	**80.00**

for plate circuits:

2½ volts, 2½ ampere hours -	**$ 2.50**
22½ " " " " -	**22.50**
Tray - - - - - - - - - - - - - -	**1.50**
22½ volt battery, complete - -	**$24.00**

All prices f. o. b. Orange, N. J.

Edison Radio Batteries can be furnished for any required voltage; prices of other assemblies on request.

Edison Radio Batteries are an investment and not a continual source of expense

Write for Bulletin 833

EDISON STORAGE BATTERY CO., (Dept. D) Orange, N. J.

RADIO INSTITUTE OF AMERICA

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AMERICA'S FOREMOST SCHOOL for Instruction in Radio Telegraphy

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Hard or soft wood, Mahogany or Walnut Finish, manufactured according to your specifications.

Wooden parts for Radio Outfits, including Variometers and Couplers.

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Here You Are Fellows!

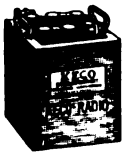
Just what you have been waiting for

Amateur
Radio Directory

Complete list of all Amateur Stations in the United States including Special and Broadcasting Stations. Notes on Construction of Receiving Set and Calibration of Wavemeter.

Dealers Write **Price $1.00** Dealers Write

Wireless Press, Inc., 326 Broadway, New York



Keco-Radio Storage Batteries

Are the highest grade batteries built especially for wireless instruments.

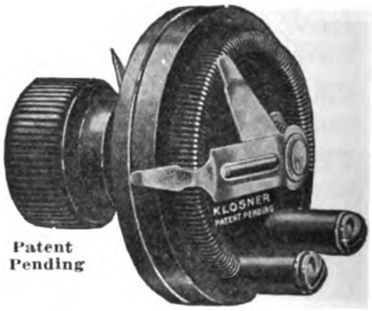
Solid oak box, natural finish, highly varnished. 6 volt, 7 heavy "Cristal" plates per cell, 50 amps.

We are one of the largest builders of exclusive high grade Wireless Batteries in the country. Thousands in use. Sold by all leading dealers or shipped direct from factory, $15.00, with book of uses and abuses of the storage battery.

KALB ELECTRIC CO., 7323 Manchester Ave., St. Louis, Mo.

Make No Mistake!

The KLOSNER Vernier Rheostat



Is the only Vernier Rheostat made having the exclusive feature of using but

One Single Knob

for both rough and fine adjustments. This feature allows the symmetrical appearance of the single knob to be retained when mounted on a panel with other instruments, and, at the same time adds to the simplicity and ease of operation in obtaining the necessary fine adjustments for best results from the modern critical vacuum tubes, especially when receiving phone and C. W. signals. We invite comparison with any other filament rheostat now made. Look for the name "KLOSNER" moulded on the base.

Your Dealer has them
or send direct to us

Price $1.50
Shipping Weight One Pound

A Two Cent Stamp Brings Interesting Literature.

Made Only by the Originators.

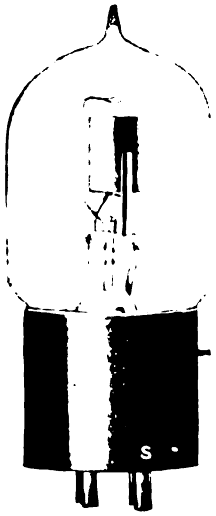
KLOSNER IMPROVED APPARATUS COMPANY
2024 Boston Road, Dept. W4
New York City

Read Pages 70 and 71

MUTUAL PURCHASERS ASS'N

Send stamp for particulars regarding the saving you can make on anything radio you require.
2-4 Stone Street, NEW YORK

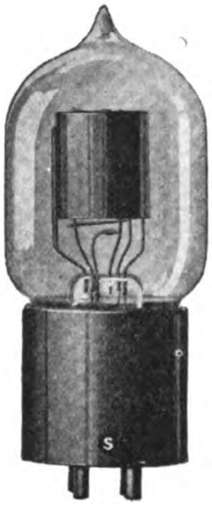
use A-P tubes for efficiency



THE A-P VT AMPLIFIER OSCILLATOR
—the Amplifier used by the U. S. Navy. "Use the tube the Navy uses." Price $6.50.

---this A-P Combination

The A-P VT AMPLIFIER OSCILLATOR and the A-P ELECTRON RELAY, with the SHAW *standard 4-prong base*, are the perfect vacuum tube combination, the *original* vacuum tube combination. Ask your dealer for these A-P tubes by name. If he does not have them, order direct —remittance must accompany order.



THE A-P ELECTRON RELAY
—the most sensitive detector of spark signals known to the radio art. Price $5.00.

A-P tubes are licensed by the Radio Corporation of America under DeForest Audion and Fleming patents for amateur and experimental use in radio communication.

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"The tubes that are used by those who KNOW"

PARAGON

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1915 First regenerative receiver ever manufactured bore the name PARAGON.

1916 First Trans-continental Amateur Reception (New York to California; not pre-arranged) effected with a PARAGON Type RA-6 Receiver.

1916 First Trans-continental Amateur Transmission (New York to California; not pre-arranged) effected by PARAGON designed transmitter.

1917-1918 PARAGON acknowledged supreme on Western Front.

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ADAMS-MORGAN CO.
Manufacturers
UPPER MONTCLAIR, N. J.

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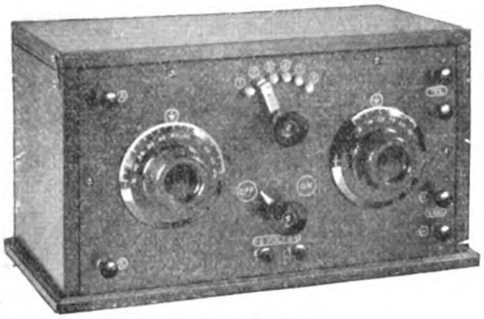
Popular RADIO RECEIVER

Type 224



Price $35

Inspect this new Tuska Set at your dealer's. The Type 224 Receiver is completely moulded. It is the ideal set for the beginner. *Two knobs;* one for wave length, the other for regeneration.

Licensed under Armstrong Patents. Send 5 Cents for our new Catalog No. 3.

The C. D. Tuska Company
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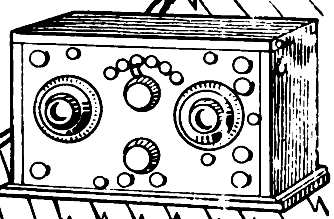

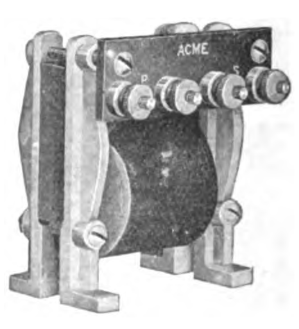

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Amplify your signals with ACME Transformers

SPECIALIZATION in building transformers as in all other lines results in a high degree of efficiency. Whether you build your own apparatus or buy assembled outfits insist on the use of proven units. Acme Transformers in your vacuum tube amplifier equipment magnify voice and music as well as code without distortion and without howling. They are priced as low as specialized quantity production permits, with due regard for quality. At all Radio dealers.

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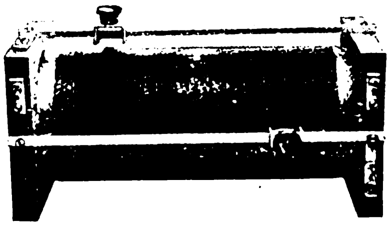

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DOUBLE SLIDE

Make Good Loading Coils

LIST PRICE - $3.00

Attractive Discounts to Dealers

3/16" Essex Sliders 25c., Mounted Crystals 25c., .001 Fixed Condensers 70c., Crystal Detectors $1.50, 3/16"x8 3/4" Square Slider Rods 20c., Aerial Wire, Lightning Arresters, Insulators, etc.

Mail Orders shipped promptly

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ALL PHASES AND FREQUENCIES IN STOCK AT ALL TIMES

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500 VOLT - 100 WATT - 3400 R.P.M.
FOR MOUNTING MOTOR GENERATOR SETS.

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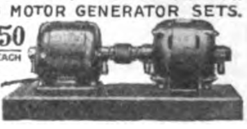

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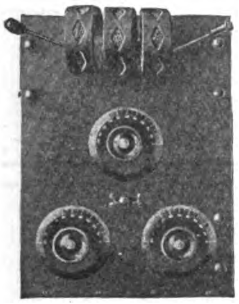
carefully wrapped
for a copy
of the greatest
radio catalog
ever put
between two covers.

DUCK'S New Radio Catalog No. 16

275 pages -- A Catalog De Luxe

NEVER in the history of radio was such a catalog printed. The radio data and diagrams, embracing upwards of fifty pages, gives the experimenter more valuable and up-to-date information than will be found in many text books selling for $2.00, and $1.00 could be spent for a dozen different radio catalogs before you could gather together the comprehensive listing of worth while radio goods found in this great catalog.

Type "Q" Receiver



An Ideal Receiving Set for Long and Short Wave and Radio Telephone Reception

This set is the most flexible receiving set on the market. With the use of the various sizes of Honeycomb Coils everything in the range of radio telegraph and telephone reception from 200 to 25,000 meters is brought into your home. Consists of a three coil mounting, and three Variable Condensers of proper capacity. Tuning extremely sharp. Remler dials.

Price without detector **$35.00**
Price with detector **$40.00**

A Brief Summary of the Radio Goods Listed in This Catalog

The entire radio catalog of the Radio Corporation, with a wealth of scientific and technical data on C. W. Transmitting sets, and all the diagrams for the assembling of these sets; the complete Remler catalog, which embraces 25 pages, the Westinghouse, Firth, Murdock, Federal, DeForest, Clapp-Eastham, Brandes, Connecticut Company, Thordarson, Turney, Magnavox Company catalogs, the best products of the Adams-Morgan, Signal and countless other manufacturers, including our own complete line of radio apparatus, and many individual items and parts used in radio work today.

THE WILLIAM B. DUCK COMPANY, 239-241 Superior St., TOLEDO, OHIO

STRADIVARA

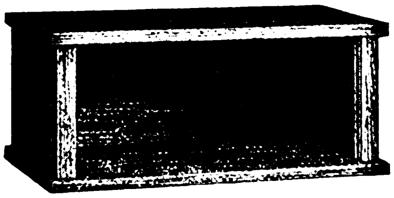
"KNOWN FOR TONE"
COSHOCTON, OHIO

RADIO CABINETS *of Quality*

RADIO CABINETS
STOCK CABINETS for the AMATEUR

RADIO CABINETS
BUILT-TO-ORDER CABINETS for the Manufacturer

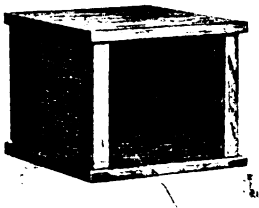
IT WILL PAY YOU TO USE STRADIVARA CABINETS BECAUSE: The history of all business is to be repeated in the radio field, viz:—there will be no place for the slipshod, the haphazard, and the mediocre. "Quality" will be the deciding factor. Repeat business will come from satisfied customers. No business can be permanently profitable if depending on first orders only. Repeat sales are the test of permanency.



MANUFACTURERS! Send us your blueprints or a sample of the cabinet you are using and get our quotations!

RETAILERS! Write for our literature and prices on stock cabinets of Quality for your retail trade. There's money in selling Quality Cabinets!

AMATEURS! Ask us for our literature and prices on a cabinet for that outfit you are building. Don't botch it with a shoddy cabinet!



We've spent 40 years building Artistic Pianos, and 6 years building High Grade Phonograph Cabinets. Ought we not be able to build superior Radio Cabinets? Ask us today for full particulars.

THE STRADIVARA COMPANY

Builders of The Stradivara Phonograph "Known for Tone" COSHOCTON, OHIO.

FEDERAL HEADPHONES

2200 OHMS $8.00 POST PAID

3200 OHMS $10.50 POST PAID

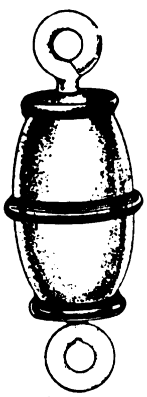
An exceptional Value—Made Possible by quantity production:

SPECIAL—For $1.50 Extra, we will equip either headset with a $1.75 Federal Universal Plug.

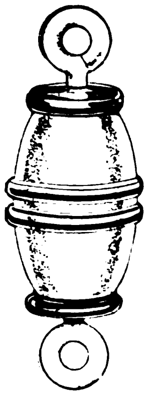
Dealers: We can supply you, too.

Our 25c "ADD-A-PAGE" Catalog is free with every cash purchase.

Somerville Radio Laboratory
176-178 Washington Street
BOSTON, MASS



No. 1



No. 2

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Handle
B. & P.
INSULATORS

Aerial Necessity Insures Safety and Perfect Insulation

Immediate Delivery

Write for Exclusive Territory and Quotation

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WIRELESS OPERATORS WANTED

LEARN WIRELESS At Home Spare Time

The demand for experts exceeds supply. Pays big salaries, $125 to $250 a month to $10,000 a year and more. Our home course will make you an expert operator in shortest possible time. Instruction by radio experts. We give you Best Theory, Text-Books and Two Instruments Free, the wonderful Omnigraph used by U. S. Gov't in examinations for license—and

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The Stromberg-Carlson No. 2-A Headset reproduces broadcasted, long-distance vocal or musical sounds with unequalled distinctness. Fine tonal qualities, extreme sensitiveness and superior construction are its important features.

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Order Above and Following Highest Grade Supplies by Mail

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PINK-A-TONE
DETECTOR OF THE AIR

MANUFACTURED BY PINKERTON ELECTRIC EQUIPMENT COMPANY

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GENERAL SALES AGENT NATIONAL SERVICE COMPANY

The Crystal Radio Receiver with the Seven Points of Superiority that has already achieved its success in New York City.

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This new home course of radio training, which has been developed for the benefit of those who cannot attend the Institute personally, is the same course used at the Institute. It includes everything from basic principles of electricity and magnetism to actual operation of commercial radio equipment, including arc and tube transmitters. It also includes the same text books used in the Institute classes, as well as a buzzer set of greatly improved design with a variable automatic transmitter for code practice.

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(Formerly Marconi Institute)
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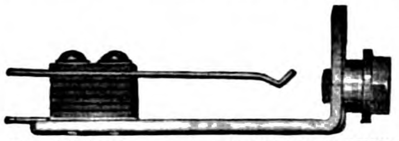
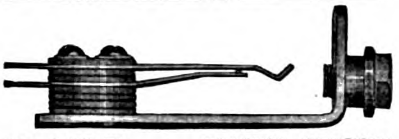
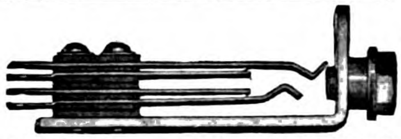
ARE STANDARD EQUIPMENT IN ALL TYPES OF APPARATUS



No. 1421-W - - OPEN CIRCUIT
PRICE EACH $.70



No. 1422-W - CLOSED CIRCUIT
PRICE EACH $.85



No. 1423-W - DOUBLE CIRCUIT
PRICE EACH $1.00

For Best Results
Demand the Genuine
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THERE ARE MANY CHEAP
IMITATIONS
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compare with the Genuine
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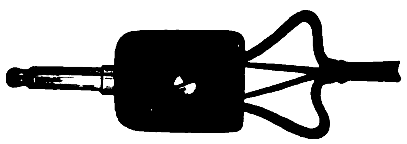
No. 1428-W $2.00 EACH



No. 15 $1.75 EACH

FEDERAL RADIO JACKS

The frame is of nickeled brass, ½" wide, ¾" high; overall length, 3½". Bakelite insulation and silver plated springs with pure silver contacts are used.

Designed for use with Nos. 15 and 1428-W Plugs.

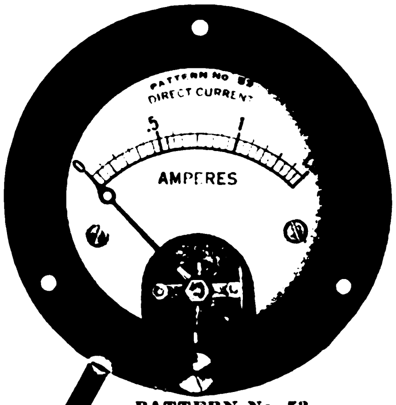
For mounting on ¼" panel only.

FEDERAL RADIO PLUGS

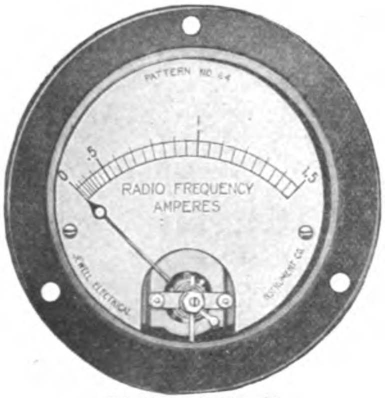
No. 1428-W Plug is a two-circuit plug, very substantially made, and will stand a breakdown test of 500 volts. Rubber bushing on cord end prevents short-circuiting of the telephone cord on the plug through excessive wear.

No. 15 Universal Plug is a radical departure from the ordinary telephone plug. Unlike others of similar design, spade terminals, pin connections, stranded or solid wire may be used without soldering.

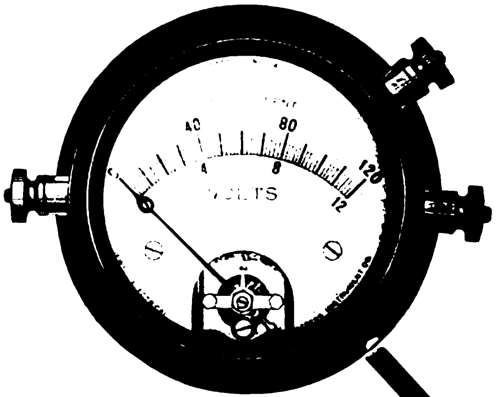
Federal Telephone & Telegraph Co.
BUFFALO, NEW YORK



PATTERN No. 53



PATTERN No. 64



PATTERN No. 54

NEW RADIO INSTRUMENTS

GET OUR NEW RADIO CIRCULAR

¶ **To get maximum efficiency from any tube receiving set, the filament current must be under proper control. To obviate using an instrument for each tube, we designed our No. 53 Triplex Filament Ammeter. For current control an ammeter is supplied with three self contained shunts, permanently in the circuit, the switch in the flange connecting the ammeter across any shunt. Also supplied as a 0-10 Voltmeter for voltage control. Price, 0-1.5 Amps. or 0-10 Volts** $10.00

¶ The Pattern No. 64 instrument shown above is a thermo-couple type of antenna ammeter and is the most satisfactory which has been produced by any manufacturer. It has no appreciable temperature error nor has it any zero shift as in the hot wire instrument. This instrument is one of the three inch Jewell Instruments now generally recognized as standard for radio work. Price, 1 to 15 Amps. $12.00

¶ Our double range Pattern No. 54 instrument shown above fills the need for a low priced portable instrument for checking battery voltages. 0-12-120 volts is the range usually supplied, which takes care of the "A" battery under all conditions and the "B" battery up to the highest commonly used for receiving. Other ranges, such as 0-10-100, 10-10-50, or 0-8-80, can be supplied. Price, 0-12-120 volts $10.00

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Jewell Electrical Instrument Co.
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Thoroughbred Apparatus

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It has been the privilege of the Marshall-Gerken Company not only to manufacture quality wireless apparatus, but to show the users the value of quality in radio instruments. They have expressed their ideal of quality in the precision required of their engineers in the making of the smallest as well as the largest part; quality construction is the key to the facility of operation of Marshall-Gerken apparatus; the factor of quality again predominates in the simplicity of the instructions by which the amateur as well as the professional obtains the highest utility from Marshall-Gerken equipment.

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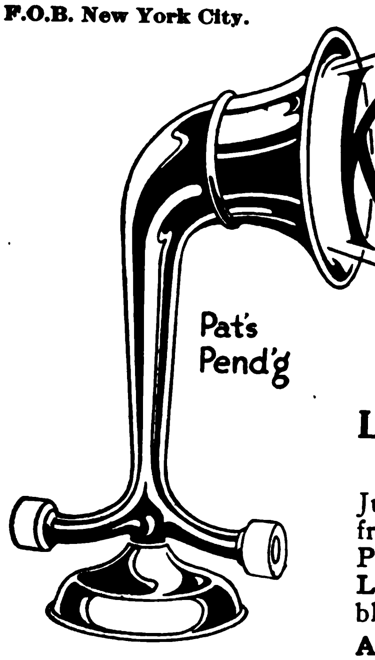

NOTICE: All infringers of this device will be vigorously prosecuted

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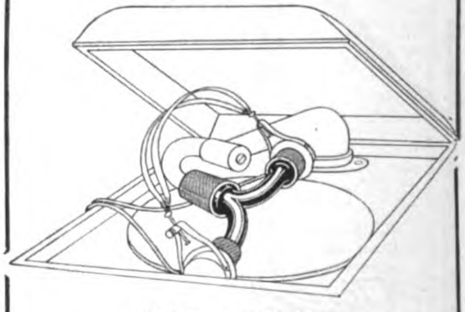

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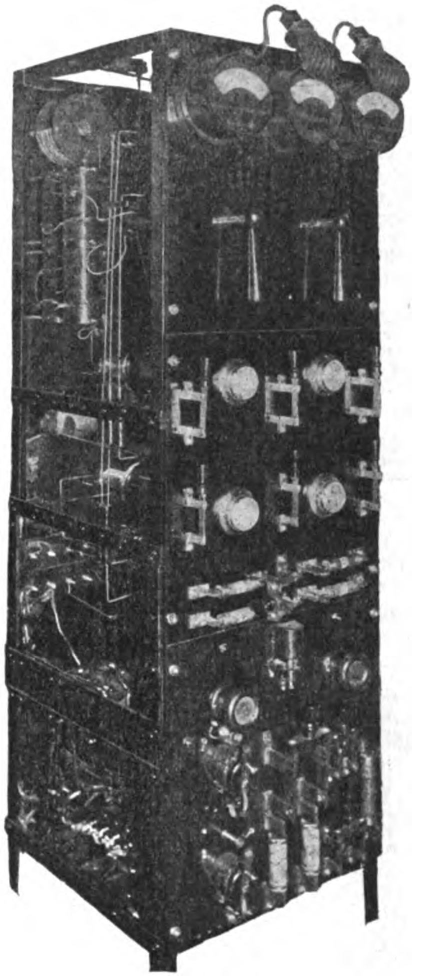

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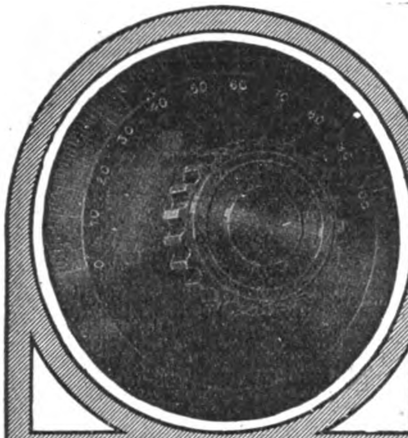

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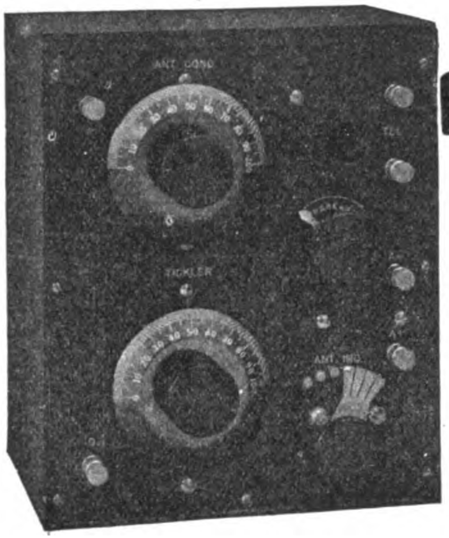

Licensed under Armstrong U. S. Patent 1,113,149

SPECIFICATIONS
Clapp-Eastham Type H. R.
Regenerative Receiver

Panel—Condensite, handsomely finished.
Cabinet—Solid Mahogany.
Condenser—Balanced type, 2 Rotary, 3 Stationary plates. Built as a Vernier.
Dials—Indestructible metal. White figures on black ground.
Antenna Inductance—Wound on Formica Tube.
Plate Inductance—Wound on molded ball.
Binding Posts—Black rubber covered.
Switch—Fan Blade.
Rheostat—C. E. Type H 400.
Circuit—Single circuit regenerative. Licensed under Armstrong U. S. Patent No. 1,113,149.
"B" Battery—Contained in compartment inside cabinet or external as desired.

QUALITY—and at a reasonable price—is the appeal that the Clapp-Eastham Type H. R. Regenerative Receiver makes to men who know Wireless equipment. The specifications and the Clapp-Eastham reputation tell them the story. To the novice, the appearance of the set, the clear, sharp tones, its wide range, and the perfect regeneration on all wave-lengths between 180 and 825 meters, is convincing evidence. The quality in the solid mahogany Cabinet is reflected all throughout the set. Ask your dealer to show it to you. If he's temporarily out—and he may be, because the demand has been phenomenal—write us. Send 6c in stamps for the C-E Radio Catalog. If you're at all interested in wireless you ought to have it.

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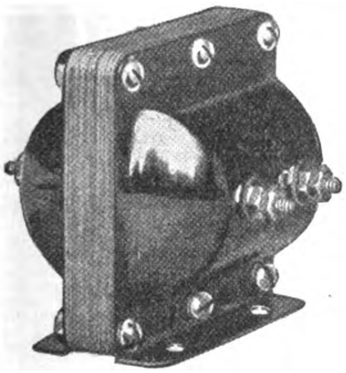
"BETTER—COST LESS"

The Sheltran

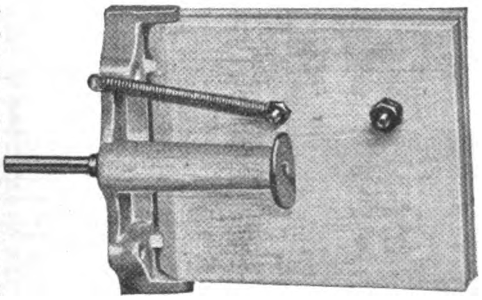
Audio Frequency Amplifying Transformer



The CROSLEY SHELTRAN AUDIO FREQUENCY AMPLIFYING TRANSFORMER. High grade materials and excellent workmanship combine to give the CROSLEY SHELTRAN great efficiency and attractive appearance so often lacking, except in the most expensive transformers. Incorporated in the design of the SHELTRAN are all the characteristics necessary to obtain maximum amplification from the modern vacuum tubes. The ratio of turns is 9/1. The CROSLEY SHELTRAN has a base area of 1¼"x2½". Net weight 12½ ounces. The over-all length is 2½"; the over-all height is 2-7/16"; and the over-all width is 2-11/16".

Price, complete ready to mount—$4.00

Crosley Variable Condensers



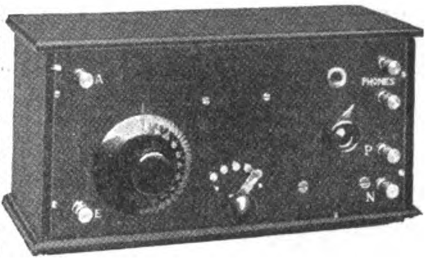
These condensers need no further introduction. They have been accepted by radio experts all over the country as being extremely efficient in all kinds of work. The Model "A" has a wood frame and the plates are high grade laminated wood. The Model "B" has die cast frame and best quality laminated wood plates. The Model "C" has die cast metal frame and porcelain plates and has a conservatively rated capacity of .001 MF. All CROSLEY CONDENSERS are tested under one thousand volts before shipment, and will not shower or break down in radio phone work.

	Price
Model "A" without knob and dial	$1.25
" "A" with knob and dial	1.75
" "A" with knob and dial mounted in mahogany finished cabinet complete with binding posts	2.50
" "B" without knob and dial	1.75
" "B" with knob and dial	2.25
" "B" with knob and dial mounted in mahogany finished cabinet with binding posts	3.00
" "C" without knob and dial	2.25
" "C" with knob and dial	2.75
" "C" with knob and dial mounted in mahogany finished cabinet with binding posts,	3.50
Crosley knobs and dials complete, each	.50

Crosley Cabinets

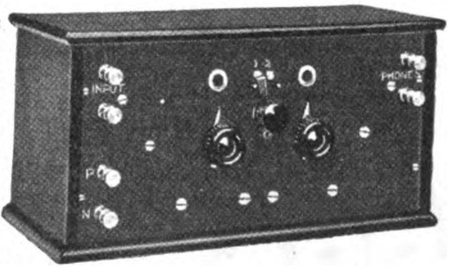
We manufacture a full line of cabinets in gum, mahogany or quartered oak, and furnish them with genuine formica panels. Prices on cabinets range from $2.50 to $10.50.

Harko Senior Radio Receiver



This instrument is a combination tuner and audion detector, and was developed to supply the demand for a low priced efficient receiving outfit with a range of 150 to over 600 meters. The hookup is special—of our own design and is non-regenerative. New Jersey, Pittsburgh, Detroit and other phones are regularly copied in Cincinnati and other points, with this receiver. The HARKO SENIOR is 11½ inches wide, 6 inches high, and 4 ⅞ inches deep. Price, complete without "B" Battery, "A" Battery or phones—$16.00.

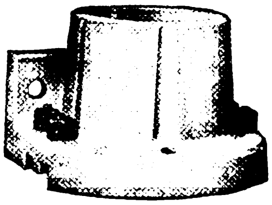
Crosley Two-Step Amplifier



This instrument was designed to give the very maximum in value and to match up with the Harko Senior, using the same sized cabinet. Complete with amplifying transformers, sockets, rheostats, switch, binding posts, etc. mounted on formica panel in mahogany finished cabinet. This efficient instrument can also be used with any other apparatus requiring two step amplifier. Price, complete as shown in illustration—$25.00.

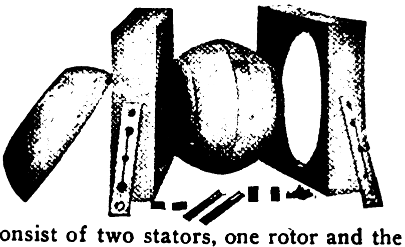
Crosley V T Socket—60c

"Better—Costs Less"



The biggest selling socket on the market today. Practically unbreakable. For either base or panel mounting: made of one piece of porcelain. No metal shell and no ground hum. Better—and costs only 60c.

Crosley Variometer Parts



Consist of two stators, one rotor and the necessary hardware as shown in the illustration for complete assembling. Shaft for knob and dial is 3/16" diameter. Wood parts are furnished either in mahogany or poplar.

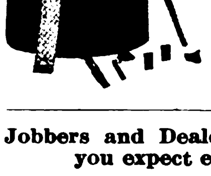
Price, complete, made of poplar wood $1.50

Price, complete, made of mahogany wood $1.75

Harko Radio Receiver

The most compact, complete and efficient crystal receiving outfit on the market. Will tune from 200 to 600 meters, bringing in spark, voice and music with amateur antenna. A wonderful little instrument. Price, complete with battery, etc.—$9.00. One thousand ohm single head set, 125 feet of wire, insulators, etc. $6.00 extra. Complete outfit—$15.00.

Crosley Variocoupler Parts



Consist of formica tube, rotor and brass hardware for complete assembling. Price, not wound or assembled, as shown in illustration, $1.50. Rotor only—40c.

Jobbers and Dealers: Order now if you expect early delivery

CROSLEY MANUFACTURING COMPANY Radio Dept. W-4 CINCINNATI, OHIO

Do You Get The Same Sound In Both Ears?

"Superior," 2,000 ohms, weight 14 ozs., complete with headband and polarity indicating cord, $8.00

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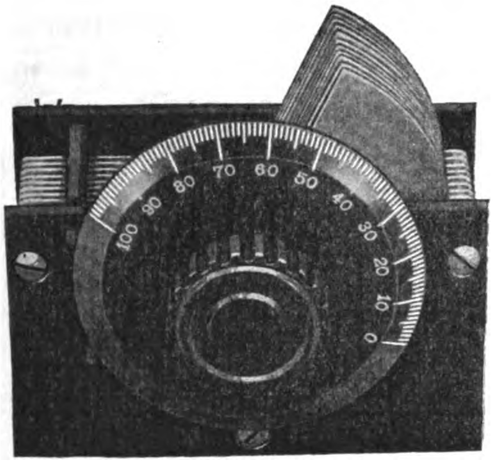
BRANDES Matched-Tone HEADSETS

"Dayton" Variable Condenser



Designed by R. S. Copp, formerly with the Engineering Division of the Air Service Radio Laboratories.

CONSTRUCTION

This condenser is of very sturdy construction, the plates being of hard aluminum; the movable plates are secured by an extra large shaft screw with large spacers, insuring against slippage of rotary plates. The stationary plates are secured by three screws thru high grade formica plates. There are no sliding contacts, the connection to the rotary plates is obtained by means of an extra flexible wire soldered to shaft, making an absolute contact at all times. This condenser is fitted with fibre stop to prevent going past zero setting.

EFFICIENCY

High frequency resistance is extremely low. Best of dielectric strength due to high grade of insulating ends, no moulded composition used. Highest grade of formica used throughout. Capacity at zero is very low. 34-plate condenser has a capacity of .000031 and 18-plate has .00002 at zero setting.

18-PLATE CONDENSER TYPE 18 P. C., PRICE $3.95

This 18-plate condenser has the same capacity as the average 21-plate condenser (.0005 Mf.) due to larger plates and close separation of plates.

34-PLATE CONDENSER TYPE 34 P. C., PRICE $4.80

This condenser has the same capacity as the average 43-plate condenser (.001 Mf.)

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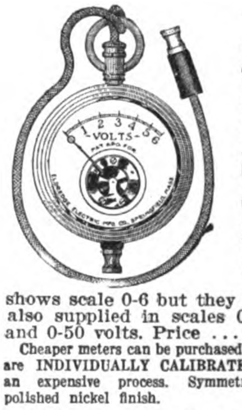

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Check up on your B Batteries!

Weakened signals can often be traced to a drop below normal voltage of your batteries, yet thousands have overlooked this important feature. An ELDREDGE *Pocket Volt-meter should be a part of every Radiophone Equipment.* Reads either direction of current. Illustration shows scale 0-6 but they are also supplied in scales 0-30 and 0-50 volts. Price **$6.50**

Cheaper meters can be purchased but ELDREDGE METERS are INDIVIDUALLY CALIBRATED to a master instrument, an expensive process. Symmetrical design and high polished nickel finish.

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10c CHARGES 'A & B' STORAGE BATTERY AT HOME WITH AN F-F BOOSTER

So You will never have to give up in disgust when working a distant station. Is it not gratifying to feel that all the year round your Filament Battery will be ready when you want it? You know what it is like to have Friends call to "LISTEN IN" and then find Your Battery dead. F-F BATTERY BOOSTERS Charge Automatically and Operate unattended. Screw Plug in Lamp Socket, Snap Clips on Battery Terminals and see the gravity come up. Both Waves of Current are rectified thru Adjustable & Easily Renewable Infusible Carbon Electrodes, which Maintain a Constant Efficiency & Last thousands of hours. Also Charges Batteries right in Autos. No skill Required. AMMETER Shows Current Flowing, eliminating Guess Work. COMPLETE IN COMPACT SELF-CONTAINED PORTABLE AUTOMATIC CHARGING UNIT. F-F Battery Boosters are Full Wave Magnetic Rectifiers for 105-125 Volt 60 Cycle A.C. Current. PRE-WAR PRICES.

Bantam Type 6 Charges 'A' 6 Volt Battery at 6 amperes	$15
Type 'B' Charges 2 to 100 Volt Radio 'B' Batteries	$15
Radio Type A-B Charges Both Your A & B Batteries	$20
Bantam Type 12 Charges 12 Volt Battery at 5 Amperes	$15
Type 166 Charges 6 Volt Battery at 12 Amperes..	$24
Type 1612 Charges 12 Volt Battery at 7 Amperes..	$24
Type 1626 Charges Both 6 and 12 Volt Batteries..	$36

The Larger Types are for heavy batteries, or where time is limited. Shipping Weights 12 to 15 Pounds. Order from your Dealer or Send Check for Prompt Express Shipment. If via Parcel Post have remittance include Postage & Insurance Charges. Or have us ship Type desired C.O.D. Other F-F Battery Boosters Charge Batteries from Farm Lighting Plants & D.C. Circuits. For GROUP CHARGING use our Full Wave, Automatic F-F ROTARY RECTIFIER of 100 Volt, 36 cell capacity.

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There is Radio Music in the air each evening, and the living voices of the artists can be reproduced in your own home and enjoyed by you and your friends.

Are you satisfied with your receiving set or would you like to build one that will receive over 6,000 miles on a single bulb and quit experimenting? One that will be equal to any regardless of claims and price—with which you can hear Honolulu, California, German, South America, French and English stations and practically all of the high powered foreign and domestic stations, as well as amateur stations as far west as New Mexico, and the phone and music.

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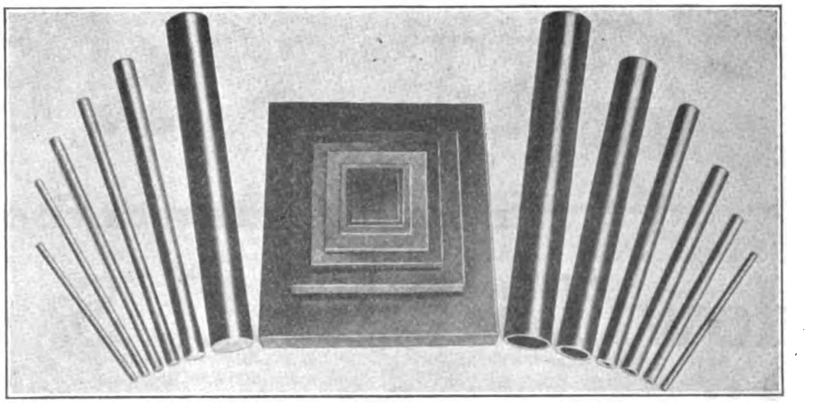

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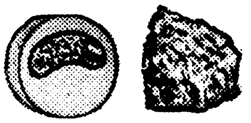

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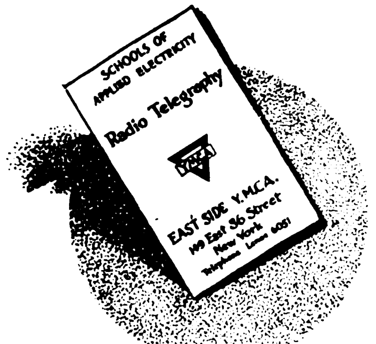

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1 DA Frank Wigglesworth, Bridge St........Manchester, Mass.
1 DD Ralph S. Johnson, 502 Huron Ave....Cambridge, Mass.
1 DP Edward E. Hayward, Jr., 50 Hall Ave..Watertown, Mass.
1 EE Thompson L. Guernsey, Main St............Dover, Me.
1 EM Arthur F. Moulton, 54 Howard St.......Reading, Mass.
1 FM Young Men's Christian Ass'n, 156 Free St., Portland, Me.
1 FI C.C.Chisholm,Jr., 862 E.Squantrum St.,Squantrum, Mass.
1 GR Nyles L. Lamson, 137 Langdon Ave....Watertown, Mass.
1 GY Lee A. Bates, 3 Blodgett Pl..........Worcester, Mass.
1 HC Harry R. Cheetham, 74 Avon St......Somerville, Mass.
1 HN L. R. Barbeau, 266 Boston Ave..Medford Hillside, Mass.
1 HS Watertown Radio Club ....Watertown, Mass.
1 HW Betty W. Munroe, 38 Beacon St........Everett, Mass.
1 IM Theo. P. Bruno, 405 Massachusetts Ave., Boston, Mass.
1 IU Moses B. L. Bradford, 60 Main St.....Concord, Mass.
1 JY Theodore F. Kalinosky, R. F. D. No. 1, Killingly, Conn.
1 KH Vernal E. Fuller, 24 Pearl St.......Dorchester, Mass.
1 KI Louis A. Jaques, 33 Pond St.......Winchester, Mass.
1 KL Minot A. Simmons, 175 Poplar St....Roslindale, Mass.
1 KW Ernest W. Merrow, Worcester St...West Boylston, Mass.
1 MG Emerson T. Rossberg, 52 Vine St....New Britain, Conn.
1 NF Arthur E. Ericson, 48 Railroad St......Beverly, Mass.
1 NH Harold M. Claflin, 19½ Western Ave...Waterville, Me.
1 NZ V. E. Rosen, 130 Court Rd...........Winthrop, Mass.
1 OG Charles E. Hyde, 11 Sidney Ave......East Lynn, Mass.
1 OM Earl A. Baker, 332 Lincoln Ave.....Cliftondale, Mass.
1 OP Thayer H. Rounsefell, 58 Reed St.......Roxbury, Mass.
1 OW Nelson B. Stackpole, 960 Manton Ave..Providence, R. I.
1 PD Richard Morse, 182 Bay State Rd.......Boston, Mass.
1 PG Henry F. Rand, 92 So. Common St.........Lynn, Mass.
1 PW J. Marston Farnum, 26 Merrimack St....Nashua, N. H.
1 PY Whitall Electric Co., Stearns Sq......Springfield, Mass.
1 PX Elbert C. Brown, 11 Harrison St......Stoneham, Mass.
1 QR James C. Ramsey, Jr., 369 Tappan St..Brookline, Mass.
1 QU Arthur E. Kumm, 163 Hallock Ave...New Haven, Conn.
1 RP Hollis E. Polk, 90 Robbins St........Waltham, Mass.
1 RV Carl G. Ricker, Willow St.........So. Hamilton, Mass.
1 RW Edwin B. Dallin, 10 Lawn Ave..........Quincy, Mass.
1 SB Edward J. Hanley, 29 Park Ave........Whitman, Mass.
1 SD Harry Hanson, 86 Quincy Ave....East Braintree, Mass.
1 SE Earl G. Holbrook, 5 Whiting St....East Detham, Mass.
1 SK G. A. F. Werner, Commercial St. Fire Sta., Lynn, Mass.
1 TJ Ludlow P. Mahan, 4 Wesley St........Newport, R. I.
1 TK Merrill C. Orswell, 37 Vassall St......Wollaston, Mass.
1 TU Leonard Jesse, Jr., 66 Bowman St......Malden, Mass.
1 UZ John Hardy, 198 Bellingham Ave....Beachmont, Mass.
1 VC Richard Baer, 19 Westover St..........Pittsfield, Mass.
1 WP Donald B. Clarke, 75 Yale St.......Springfield, Mass.
1 WS Herbert A. Wells, 151 Ballou Ave.....Dorchester, Mass.
1 WW Frederick Waite, 9 High Rock Way.......Allston, Mass.

1 AAM Isaac Goldstein, 36 Oswego St...........Boston, Mass.
1 ABF C. P. Boynton, 328 Greenwich Ave...New Haven, Conn.
1 ABK William J. Smith ....So. Westport, Mass.
1 ACH George Dana Sprague, 49 Elm St., Wellesley Hills, Mass.
1 ACM James Alfred Mulligan, Shawsheen Village, Andover, Mass.
1 ADI Hiram D. Harris, 53 Williams St...New London, Conn.
1 AEM Michael F. Goodell, 79 Blossom St......Chelsea, Mass.
1 AFM Harold A. White, 17 Prairie Ave.....Auburndale, Mass.
1 AFY Oscar H. Crie, 233 Broadway..........Rockland, Me.
1 AGM Henry A. Tadgell, 110 Porter St.....Somerville, Mass.
1 AGY Arthur N. Fay, 22 Arlington St..Chicopee Falls, Mass.
1 AHZ Howard Noyes Dole, 27 Columbus Ave..Haverhill, Mass.
1 AIR Edmund P. Crocker, 23 Hussey St....Nantucket, Mass.
1 AJF Howell B. Morley, 38 Beacon St.........Boston, Mass.
1 AMS John P. Olson, Glendale Rd.............Sharon, Mass.
1 AMV Harrison M. Haskell, Corey Hill Hosp...Brookline, Mass.
1 ANP William C. Denis, 200 French St.......Lowell, Mass.
1 AOT Wm. J. Martin, 538 Massachusetts Ave...Boston, Mass.
1 ARM Charles S. Crocker, Box 41......Marston's Mills, Mass.
1 ASX Harold B. Richmond, 73 Harlow St....Arlington, Mass.
1 ASY Horace Goss, Box 1.......................Essex, Conn.
1 AWE Norman H. Miller, 25 Phillips St.....Providence, R. I.
1 AWT Carl W. Phillips, 125 Center St.........Malden, Mass.
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1 AYH Arnold Neilson, Box 946 ....Hartford, Conn.
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1 BCN Edward Gosselin, 69 So. 6th St.......Hartford, Conn.
1 BCS Charles F. Woodbury, 12 Essex St.........Dover, Me.
1 BDI F. Edward Handy, University of Maine......Orono, Me.
1 BDS Homer G. Ringwood, 646 Shawmut Ave...Boston, Mass.
1 BFC Harold H. Bodwell, Old Colony Rd......Meriden, Conn.
1 BII Jay S. Buckley, 10 Hillside St......So. Norwalk, Conn.
1 BIN Alfred C. Keller, Merritt St..........Bridgeport, Conn.
1 BJA Royal D. Chandler, 52 Oakley Rd.......Belmont, Mass.
1 BKN Wilfred Vigneault (The Airfone Co.), 103 Merrimack St., Haverhill, Mass.
1 BLE Harold B. McNamara, 23 Alpine St....Arlington, Mass.
1 BML Edward R. Carter, 5 White St.........Haverhill, Mass.
1 BNG Theodore Taylor, 167 Salisbury Rd....Brookline, Mass.
1 BOY Henry C. Aspinall......................Oakville, Conn.
1 BQD G. M. Mathewson, 39 Rhode Island Ave., Newport, R. I.
1 BUO Emil F. Karklin, 2261 Centre St..West Roxbury, Mass.
1 BVG Everett M. Maguire, 75 Lawn Ave......Woodfords, Me.
1 BZC Roy S. Litle, Elliot & Capon Rd.....Swampscott, Mass.
1 BZG Everett Radio Club, 81 Swan St........Everett, Mass.

1 CAV L. E. Ticehurst, 76 Irving St....West Somerville, Mass.

1 CDB Henry A. Cain, 593 Ash St..........Brockton, Mass.
1 CDM Gordon W. Battey, Samoset St.......Watch Hill, R. I.
1 CDN George H. James.......................Hardwick, Vt.
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1 CJP Carl C. Howard, 10 Conwell St.......Somerville, Mass.
1 CJQ John G. Nolan, 76 Fountain St........Medford, Mass.
1 CJR Herbert M. Cox, Jr., 6 Arbutus Rd....Swampscott, Mass.
1 CJS Lars J. Sandberg, 11 Wolcott Rd.....Winchester, Mass.
1 CIT Andrew A. Stone, 76 Belmont Ave......Brockton, Mass.
1 CJU Thomas C. Crocker, 50 Locke St.........Ansonia, Conn.
1 CJV Arthur E. T. Carlson, 57 Standish St..Worcester, Mass.
1 CJW Waldemar I. Bendz, 3 Prospect St.....Fitchburg, Mass.
1 CJX Thurston Stetson, 297 East St...........Elmwood, Me.
1 CJY R. H. Keith, 231 Plymouth St..East Bridgewater, Mass.
1 CJZ Thomas R. Walsh, 31 Eighth St..........Derby, Conn.

1 CKA Eino A. Kajander, 20 Dartmouth St....Maynard, Mass.
1 CKB Harland W. Powers, 8 Lincoln St.......Maynard, Mass.
1 CKC Wilbur T. Moulton, 127 Paradise Rd..Swampscott, Mass.
1 CKD Douglass C. Beeman, 198 East Ave.....Burlington, Vt.
1 CKE Harold C. Stewart, 185 Wahconah St...Pittsfield, Mass.
1 CKF Samuel Groome, Kent School ....Kent, Conn.
1 CKG L. R. Edwards, Park & Chalmers Sts., Bridgeport, Conn.
1 CKH Alexander K. Lainge, Dartmouth College..Hanover, N. H.
1 CKI Salvatore Torneo, 33 Lewis St..........Winsted, Conn.
1 CKJ Harold E. Curtis, Mechanic St.........Kennebunk, Me.
1 CKK Elgar L. St. Clair, 70 Fenton Ave......Laconia, N. H.
1 CKL Harold W. Castner, 15 Temple St........Portland, Me.
1 CKM Robie H. Bissell, North St.............Medfield, Mass.
1 CKN Richard E. Burton, 323 Clark Rd......Brookline, Mass.
1 CKO Allan H. Adams, Littleton St.......Chelmsford, Mass.
1 CKP George H. Pinney, 84 Prospect St., So. Manchester, Conn.
1 CKQ Everett H. McRonald, 27 Belknap St.....Portland, Me.
1 CKR Charles S. Doe, Maple Hill Farm......Walpole, N. H.
1 CKS Ralph P. Sterritt, 16 Ridge Rd.........Waverly, Mass.
1 CKT W. W. Lana, 697 Westminster Hill Rd., Fitchburg, Mass.
1 CKU George K. Webb, Summer St..........Kennebunk, Me.
1 CKV Kenneth G. MacLean, 10 Eliot St.........Quincy, Mass.
1 CKW Stanley R. Ames, 34 Prospect St.......Rockland, Mass.
1 CKX H. E. Bissell, Jr., 22 Van Buren Ave...Norwalk, Conn.
1 CKY Harold H. Morrell, 52 Goffe St......New Haven, Conn.
1 CKZ Raymond W. Needham, 10 Grove St.....Pittsfield, Mass.

1 CLA Herbert Nelson Brownell, 47 Fair St...Nantucket, Mass.
1 CLB Chester Wirt White, 436 Main St........Lewiston, Me.

1 CLC Frank Otis Frowne, 55 May St....So. Attleboro, Mass.
1 CLD Arthur W. Johnson, 6 Watson Ave......Worcester, Mass.
1 CLE Ernest M. Howland, 18 Cottage St.....Elmwood, Mass.
1 CLF Edward Everett Hale, 226 Main St......Webster, Mass.
1 CLG Frank H. Conant, 24 Third St........Attleboro, Mass.
1 CLH John T. Griffin, 36 Edison St...........Quincy, Mass.
1 CLI Harry W. Thomson, Grove St.........Millbury, Mass.
1 CLJ Harold F. Davis ....Northfield, Mass.
1 CLK L. A. Gould, Shalit Bldg, Middle St., Bridgeport, Conn.
1 CLL Elmer E. Waeger, 25 Tannery St......Cambridge, Mass.
1 CLM Thomas Bastable, 77 Cleveland St.......Malden, Mass.
1 CLN Carl Henry Biron, 1097 Tyler St......Pittsfield, Mass.
1 CLO Donald J. Baker, 718 Maple Ave.......Hartford, Conn.
1 CLP Laurance Smith Hovey, 217 Main St....Bradford, Mass.
1 CLQ James J. Welch, 107 Mason St..........Salem, Mass.
1 CLR Mitchell Adams, Jr., 225 Hunts Ave....Pawtucket, R. I.
1 CLS Richard Warren Jones, 50 Main St.....Plymouth, Mass.
1 CLT Joseph M. Wishengrad, 3620 Main St..Bridgeport, Conn.
1 CLU Emile Sutherland, 31 Hadley St...No. Cambridge, Mass.
1 CLV Laurence W. Murray, 150 Essex St...Cliftondale, Mass.
1 CLW Albert A. Johnson, 1419 Beacon St.....Brookline, Mass.
1 CLX George F. Caldwell, Main St........Stockbridge, Mass.
1 CLY George Lorine Penney, 7 Burrit St.......Nashua, N. H.
1 CLZ F. H. Smyser, 683 Washington St......Brookline, Mass.

1 CMA John G. Kreis, 3055 State St.......No. Haven, Conn.
1 CMB Edward Venner, 24 May St.........No. Andover, Mass.
1 CMC Michael John Welsh, 43 Sanford St......Melrose, Mass.
1 CMD Henry W. Saunders, 8 Spring St........Westbrook, Me.
1 CME Raymond Dana Kneeland, 63 Pond St. Georgetown, Mass.
1 CMF William A. Nash, 457 Main St........Biddeford, Me.
1 CMG Harry Irving Heaney, Ayer Ave..........Lowell, Mass.
1 CMH Louis Risoli, 1 Washington Sq..........Salem, Mass.
1 CMI B. F. Cutter, 1069 Westminster St...Providence, R. I.
1 CMJ Max Ortelt, 27 Sampson St..........Providence, R. I.
1 CMK Philip Henry Bloom, 682 East St.......Holyoke, Mass.
1 CML Thomas F. McNamara, 134 Taylor St..Waltham, Mass.
1 CMM William Purdy, 33 Laurel St.........Watertown, Mass.
1 CMN H. G. Dolphin, 213 Commerce St....New Haven, Conn.
1 CMO Luther A. Jones, Bourne St............Kennebunk, Me.
1 CMP William E. Jackson, 7 DeFoe Pl......Providence, R. I.
1 CMQ Edwin Sargeant, 67 Alger Ave........Providence, R. I.
1 CMR John Lincoln Perkins, 34a Tower St...Somerville, Mass.
1 CMS Edward F. Curley, 210 W. London St....Lowell, Mass.
1 CMT George R. Cogswell, 18 Concord Ave...Cambridge, Mass.
1 CMU Warren Higgins, 406 Hollis St......Framingham, Mass.
1 CMV Bernard C. McQuire, 261 Foster St......Lowell, Mass.
1 CMW Roger W. Dodd, 43 Alpha Rd........Dorchester, Mass.
1 CMX Jefferson Borden, IV, 291 Cherry St...Fall River, Mass.
1 CMY Francis E. Tyburc, 174 Derby St........Salem, Mass.
1 CMZ George F. Cory, 383 Cottage St....New Bedford, Mass.

1 CNA Walter A. Knight, 47 Church St.........Hudson, Mass.
1 CNB Jamieson B. Hall, Fort Andrews..........Boston, Mass.
1 CNC Howard Hicks, 298 Winthrop Ave.........Revere, Mass.
1 CND Bartlett W. Bibby, 34 High St........Westboro, Mass.
1 CNE Charles E. Lynch, 175 Hinckley St..Northampton, Mass.
1 CNF William S. Allen, St. Mark's School...Southboro, Mass.
1 CNG William A. Osborne, Jr., Main St......Hyannis, Mass.
1 CNH G. N. Rang, c|o Army & Navy Y.M.C.A., Newport, R. I.
1 CNI Harold C. Reynolds, 14 Lakeview Ave......Lynn, Mass.
1 CNJ Andrew R. Connet, 67 Whitmarsh St...Providence, R. I.
1 CNK Harlan Ross Watson, 25 Wilson St.....Burlington, Vt.
1 CNL Edwin A. Goodwin, 127 High St....Somersworth, N. H.
1 CNM John A. Lucas, 547 Bruce Ave.......Stratford, Conn.
1 CNN Herbert Thomas Osgood, 1 Brooks Court....Salem, Mass.
1 CNO Arlington Bell, 88 South St..........Stamford, Conn.
1 CNP Everett L. Roberts, 34 Sixth St..........Bangor, Me.
1 CNQ Joseph B. Maher, Anderson Ave.......Woodmont, Conn.
1 CNR Delta Electric Company, 658 Main St..Worcester, Mass.
1 CNS Thomas H. Gavin, 583 Centre St.....Fall River, Mass.
1 CNT Russell S. Mears, 371 Main St........Haverhill, Mass.
1 CNU Hermon R. Dyke, 197 St. Botolph St....Boston, Mass.
1 CNV Owen R. Garfield, 9 Webster St.......Middleboro, Mass.
1 CNW Remo Fontana, 48 Bosworth St..West Springfield, Mass.

1 CNX Chas. A. Kelleher, 81 Plymouth St., No. Abington, Mass.
1 CNY John Randolph Quick, 12 Park St........Lynn, Mass.
1 CNZ Frank W. Harney, 229 Harvard St....Cambridge, Mass.

1 COA Robert L. Northrop, 125 Ocean St.........Lynn, Mass.
1 COB M. F. Damon, 6 Church St...Weymouth Heights, Mass.
1 COC Ervin L. Crandell, 31 St. Luke's Rd.....Allston, Mass.
1 COD Arlington Radio Club, 15 Foster St...Arlington, Mass.
1 COE Clifford L. Walton, 286 Front St.....So. Portland, Me.
1 COF Middleboro Y.M.C.A., No. Main St....Middleboro, Mass.
1 COG Donald O. Friend, 623 Main St.........Woburn, Mass.
1 COH Norman H. Young, 87 Main St..........Malden, Mass.
1 COI Stephen D. Trafton, 323 Minot Ave......Auburn, Me.
1 COJ Edw. J. Murphy, 27 Columbia Rd...No. Andover, Mass.
1 COK New Lon. Radio Club, 44 Meridian St., New London, Conn.
1 COL Ralph H. Spaulding, 71 Piggott Rd.....Medford, Mass.
1 COM Francis J. Sweeney, 83 Yorktown St....Somerville, Mass.
1 CON Frederick B. White, 141 Columbia Ave...Cranston, R. I.
1 COO Winfred J. Lindsay, Main St..........Millbury, Mass.
1 COP Robert G. Ling, 16 Porter St..........Danvers, Mass.
1 COQ Samuel Brestin, 28 Water St..........Danvers, Mass.
1 COR L. W. Pomeroy, 303 Hannibal Hamlin Hall, Orono, Me.
1 COS John F. Karl, 7 Wilcox St..........New Haven, Conn.
1 COT Ralph C. Hollis, 22 Cleveland Ave.....Braintree, Mass.
1 COU Bernard L. Cook, 104 College Ave......Medford, Mass.
1 COV E. Whitford Merritt, High St......No. Scituate, Mass.
1 COW Fred J. Thompson, Main St........West Upton, Mass.
1 COX Auburn Electrical Co., 95 Turner St......Auburn, Me.
1 COY J. E. LeMarche, 1038 Massa. Ave....Cambridge, Mass.
1 COZ James W. Thompson, 28 Channing St...Newport, R. I.

1 CPA J. W. Spalding, 304 Greenwich Ave..New Haven, Conn.
1 CPB Henry J. Welsh, 8 Sharon Rd...........Quincy, Mass.
1 CPC Wilder Arthur Fernald, 15 Cambridge St., Lowell, Mass.
1 CPD Samuel J. Tillotson, 55 Fountain St....Worcester, Mass.
1 CPE Frank Robert Leave, 2 Pearl St.......Dorchester, Mass.
1 CPF John A. Grant, 15 Elm St.............Everett, Mass.
1 CPG Arthur F. G. Bruder, High St...........Upton, Mass.
1 CPH Paul St. Jacques, Jr., 272 Adams St..Woonsocket, R. I.
1 CPI Waldo James Kelley, 26 Winsor St...Watertown, Mass.
1 CPJ Ralph F. Atwood, 61 Howard St.......Reading, Mass.
1 CPK Paul Alfred Carroll, 12 John St.......Reading, Mass.
1 CPL Harold B. Reynolds, 212 Albion St.....Wakefield, Mass.
1 CPM Perry P. Nichols, R. F. D..............Randolph, Vt.
1 CPN Paul Milton Morse, 4 Humboldt Ave....Worcester, Mass.
1 CPO Robert P. Slayton, Portland St.........Morrisville, Vt.
1 CPP Bernard K. Newman, 7 Quintard Ave..So. Norwalk, Conn.
1 CPQ Frank I. Bickford, 137 Burrill St....Swampscott, Mass.
1 CPR Thornton Academy, Main St...............Saco, Me.
1 CPS C. W. Howard, 261 Huntington St...New London, Conn.
1 CPT Maurice W. Clayton, 7 Briggs Court..New Bedford, Mass.
1 CPU S. F. Beauchamp, 759 Chicopee St., Williamansett, Mass.
1 CPV Paul E. Boyce, 592 Central Ave.......Westville, Conn.
1 CPW Selwyn N. Blake, Jr., 111 Winthrop Rd., Brookline, Mass.
1 CPX Roger Williams, 44 Pitman St.......Providence, R. I.
1 CPY Paschal Ierardi, 38 Campfield St.......Hartford, Conn.
1 CPZ Francis P. Pallotti, 176 Preston St.....Hartford, Conn.

1 CQA Herbert L. Eby, 383 Connecticut Ave., Bridgeport, Conn.
1 CQB John Henry Kelly, Jr., 38 Carroll Ave....Newport, R. I.
1 CQC Hal I. Jayne, 103 Cottage St........Bridgeport, Conn.
1 CQD Albert S. Brookes, Salisbury School....Salisbury, Conn.
1 CQE William C. Schappa, 144 Dover St....New Haven, Conn.
1 CQF Lee D. Bowman, 68 Summer St........Springfield, Vt.
1 CQG James R. Wilkie, Royal Mills ....Riverpoint, R. I.
1 CQH William H. Burke, Fellows Rd..........Ipswich, Mass.
1 CQI William H. Smith, 232 Howard Ave...New Haven, Conn.
1 CQJ Neal Dow, 17 Lincoln St..............Exeter, N. H.
1 CQK John L. Peters ....East Holliston, Mass.
1 CQL Waldo M. Sanborn, 16 Merrimack St....Concord, N. H.
1 CQM George Read Town, 18 Church St.......Poultney, Vt.
1 CQN Arthur E. Parker, 14 Chestnut St.........Auburn, Me.
1 CQO F. S. Huddy, The Choate School.....Wallingford, Conn.
1 CQP Russell E. Cushing, 21 Elbridge St....Worcester, Mass.
1 CQQ Perry F. Van Derzee, 70 Ruggles St......Roxbury, Mass.
1 CQR Lawrence E. Marston, 76 Goff St..........Auburn, Me.

1 CQS Edward W. Ljongquist, 28 Madison Ave..Hartford, Conn.
1 CQT Robert A. Martin, 193 College St.......Lewiston, Me.
1 CQU Dexter B. Waterhouse, 193 College St...Lewiston, Me.
1 CQV Philip M. Houston, 58 Elm St.......Bradford, Mass.
1 CQW Russel E. Thomas, 105 Bellevue Ave.....Newport, R. I.
1 CQX Kenneth G. Callahan, Cottage St.........Sharon, Mass.
1 CQY Elmer Ralph Merrow, 208 Main St........Auburn, Me.
1 CQZ Claude H. Leroux, 74 Franklin St...New Britain, Conn.

1 CRA Winslow H. Pillsbury, 42 North St..........Saco, Me.
1 CRB John Wm. Fischer, Jr., 5 Hawthorne Pl..Milford, Conn.
1 CRC Emery E. Neff, 400 Waverley Oaks Rd., Waltham, Mass.
1 CRD Charles M. Nash, 51 South St.........Plainville, Mass.
1 CRE Edward H. Diggins, 35 Stone Ave....Somerville, Mass.
1 CRF Frederick E. Allen, 21 Cross St.......Brockton, Mass.
1 CRG F. L. Curran, 96 North Bend St......Pawtucket, R. I.
1 CHH R. W. Thomas, 674 Washington Ave., West Haven, Conn.
1 CRI Stanley N. Read, 191 Alabama Ave...Providence, R. I.
1 CRJ Carl D. Hichborn, 11 Spring St.........Foxcroft, Me.
1 CRK Robert L. Allen, 119 Derby St......New Haven, Conn.
1 CRL Bridgeport High School ....Bridgeport, Conn.
1 CRM George Parker Lawton, Tiverton 4 Corners, Tiverton, R. I.
1 CRN Reginald V. Peirson, 4 Coggeshall Ave...Newport, R. I.
1 CRO Robert Warner, 1 Kennedy Rd........Cambridge, Mass.
1 CRP Donald W. King, 396 Walnut St.....Springfield, Mass.
1 CRQ Joseph Poscavage, 281 No. Main St.....Ansonia, Conn.
1 CRR Gordon R. Dailey, 65 Chatham St....New Haven, Conn.
1 CRS Henry R. Bartlett, 28 First St.........Pittsfield, Mass.
1 CRT Leon A. Richardson, 7 Pleasant St..Farmington, N. H.
1 CRU George D. Littlefield, Main St..........Searsport, Me.
1 CRV John Lee Pike, 28 Oak St..........So. Portland, Me.
1 CRW Jeffrey-Nichols Motor Co., 971 Commonwealth Ave.,
Boston, Mass.
1 CRX Charles Desellier, 74 Clay St........Cambridge, Mass.
1 CRY George N. McNeil, 347 Linwood Ave..Newtonville, Mass.
1 CRZ Richard M. Longley, 45 Grove St.....Peterboro, N. H.

1 CSA John F. Cole, 136 Perkins St........Somerville, Mass.
1 CSB Thorndike B. Bliss, 312 Maple St......Danvers, Mass.
1 CSC Fred. S. Robbins, 31 West Baltimore St., Lynn, Mass.
1 CSD C. M. Janvrin, 976 Connecticut Ave., Bridgeport, Conn.
1 CSE Edward G. Howe, 409 So. Union St....Burlington, Vt.
1 CSF John H. Ellison, 32 Bow St.........Somerville, Mass.
1 CSG Turner W. Learned, 144 Veranda St......Portland, Me.
1 CSH Wilfred J. Peltier, 40 Austin St......Cambridge, Mass.
1 CSI Lloyd G. Manchester, 58 Spencer St.....Winsted, Conn.
1 CSJ Adrien Roy, 215 Blake St............Lewiston, Me.
1 CSK Lloyd A. Blanchard, 248 N. Main St...Springfield, Mass.
1 CSL I. B. Woundy, 16 Railroad ave......New Canaan, Conn.
1 CSM Winthrop Martin, 16 Montgomery Ave...Somerville, Mass.
1 CSN William J. Bentley, 3546 Washington St...Boston, Mass.
1 CSO Vernon A. Luce, 25 Canby St..........Holyoke, Mass.
1 CSP Charles J. Mudri, 1927 Seaview Ave...Bridgeport, Conn.
1 CSQ Terrance J. Lomax, Jr., 74 Conant St..Fall River, Mass.
1 CSR Harold S. Pike, 16 Maxson St......West Mystic, Conn.
1 CSS Glen A. Hall ....Boscawen, N. H.
1 CST Edward Ellis, 147 Harold St..........Roxbury, Mass.
1 CSU Carl B. Curtice, 83 Kaposia St......Auburndale, Mass.
1 CSV Gerald C. Goudy, Sewall's Hill.......York Village, Me.
1 CSW Chester F. Scott, 29 Alice Ave.......Woonsocket, R. I.
1 CSX Raymond O. Mortensen, 171 Cherry St...Malden, Mass.
1 CSY George H. Rodick, 36 Elsner Ave......So. Portland, Me.
1 CSZ John B. Russell, Jr., 33 Newcastle Rd...Brighton, Mass.

1 CTA Thomas H. Eames, 11 Chapel St., West Somerville, Mass.
1 CTB Edward I. Phillips, 12 Ward Pl.....West Haven, Conn.
1 CTC Melvin H. Johnson, 104 Johnson Ave...Winthrop, Mass.
1 CTD Robert O. Scofield, 95 North St.........Stamford, Conn.
1 CTE Hollis Bradbury, 115 Whitney St.........Auburn, Me.
1 CTF Walter W. Taylor, 50 Clifford St.......Taunton, Mass.
1 CTG Raymond A. Harris, 66 Prospect Ave....Norwood, Mass.
1 CTH Everett J. Coulson, 54 Franklin St.....Whitman, Mass.
1 CTI Frederick A. Ells, Jr., 2 Mott Ave.....Norwalk, Conn.
1 CTJ George C. Barney, 524 Goebel St.......Berlin, N. H.
1 CTK Carl B. Newman, 15 Proctor St.......Worcester, Mass.

Second District

2 BXI Police Dept. (C. Coffey, Opr.), City Hall, Jersey City, N. J.
2 BXJ Wesley B. Simpson, 207 6th Ave.......Brooklyn, N. Y.
2 BXK Richard S. Young, 380 Rugby Rd.......Brooklyn, N. Y.
2 BXL Brenneman Quereau, New York Ave...White Plains, N. Y.
2 BXM Milton Beards, 7304 3rd Ave..........Brooklyn, N. Y.
2 BXN Erwin William Vogel, 61 Southern Blvd..New York City
2 BXO Joseph Leone, 2275 Bassford Ave.........Bronx, N. Y.
2 BXP Thomas E. Platt, 215 Dunellen Ave.....Dunellen, N. J.
2 BXQ Oscar A. Hauger, R.F.D. No. 3, Box 152..Haledon, N. J.
2 BXR Samuel C. Hooker, Jr., 82 Remsen St...Brooklyn, N. Y.
2 BXS Stanley Kelper, 1571 First Ave.........New York City
2 BXT Robert Dixon Smith, 55 La Salle St.....New York City
2 BXU Anthony J. Purcell, 41 Carleton St..East Orange, N. J.
2 BXV William A. Miller, R.F.D. No. 4..New Brunswick, N. J.
2 BXW Archie W. Cullen, Main St.............Altamont, N. Y.
2 BXX Joe Wagner ....Adelphia, N. J.
2 BXY Edward Gundrum, 303 Cherry St......Elizabeth, N. J.
2 BXZ Harold Arthur Weeks, 64 Steers Ave..Schenectady, N. Y.

2 BYA Burton T. Vail, 172 Lorraine Ave....Schenectady, N. Y.
2 BYB Not issued.
2 BYC Daniel White Smith, South St........Oyster Bay, N. Y.
2 BYD Michael J. Zaleski, 350 Port Ave......Elizabeth, N. J.
2 BYE Henry C. Hunter, 217 East 7th St.....Plainfield, N. J.
2 BYF Kelly & Phillips (L. Jacquet, Opr.), 312 Flatbush Ave.,
Brooklyn, N. Y.
2 BYG Harry Emil Wirth, 519 W. 121st St....New York City
2 BYH A. G. Larsen, 27 Mackey Ave..Port Washington, N. Y.
2 BYI Ernest Thelen, Belmont Ave........No. Haledon, N. J.
2 BYJ Morris Levy, 233 Division St...........New York City
2 BYK Louis Oroin, 54 Cook St.............Brooklyn, N. Y.
2 BYL Elliott Blood, Westervelt Pl......West Englewood, N. J.
2 BYM George Sheigell, 269a 17th St........Brooklyn, N. Y.
2 BYN Benjamin Christie, 538 E. 145th St.....Bronx, N. Y.
2 BYO Moe Joffe, 52 West 117th St...........New York City
2 BYP James Millen, 140 Fife St.........Forest Hills, N. Y.
2 BYQ Martin Landesberg, 853 Lafayette Ave..Brooklyn, N. Y.
2 BYR Henry Furch, 258 Johnston Ave.....Jersey City, N. J.
2 BYS Lee P. Davis, Jr., 18 Lake Ave.........Yonkers, N. Y.
2 BYT Charles E. Francis, 1662 70th St....Brooklyn, N. Y.
2 BYU Fred Hirsch, 3568 Park Ave...........Bronx, N. Y.
2 BYV Hugh V. D. Roberts, 296 Fulton St....Jamaica, N. Y.
2 BYW Benjamin Alan Mayhew, Laurel Ave......Tenafly, N. J.
2 BYX Hubert A. Greenidge, 56 W. 139th St..New York City

2 BYY Frank V. Bremer, 421 Summit Ave..West Hoboken, N. J.
2 BYZ W. C. Vining, 15 Ridgeview Ave....White Plains, N. Y.

2 BZA D. Killoch Co. (R. Nordstrom, Opr.), 1675 E. 13th St.,
Brooklyn, N. Y.
2 BZB Walter H. Sperr, 1241 E. 34th St.....Brooklyn, N. Y.
2 BZC Ralph Rosenberg, 120 E. 86th St........New York City
2 BZD A. Nielson, 113 Bayview Ave...Port Washington, N. Y.
2 BZE Howard C. Coleman, 39 Carman St....Patchogue, N. Y.
2 BZF John Dickson Sembler............Locust Valley, N. Y.
2 BZG Floyd Arthur Chichester, 318 East Constance Court,
Hammels, Rockaway, Beach, N. Y.
2 BZH David John Scott, 1032 Evergreen Ave...Plainfield, N. J.
2 BZI Timothy J. Smith, East Main St.....Sayresville, N. J.
2 BZJ Walter H. Grove, Jr., West Main St..Farmingdale, N. J.
2 BZK Edward Harbolick ....Buchanan, N. Y.
2 BZM Arthur M. Mapes, 56 Railroad Ave.....Patchogue, N. Y.
2 BZN Edwin Hobbs, Sycamore Ave.........Little Silver, N. J.
2 BZO Paul Rizzo, 571 39th St............Brooklyn, N. Y.
2 BZP Frank H. Wilson, 11811 97th Ave...Morris Park, N. Y.
2 BZQ Rollin Edward Priest, 161 West 66th St., New York City
2 BZR Henry Bentman, 1529 Hoe Ave..........Bronx, N. Y.
2 BZS Carlos Ellison, 3301 Broadway..........New York City
2 BZT John Heddaeus, 522 Greene Ave.......Brooklyn, N. Y.
2 BZU Irvington High School (Frank Harrison, Opr.),
Madison Ave., Irvington, N. J.
2 BZV William L. Eckert, 291-93 Broadway....Astoria, N. Y.
2 BZW Walter Andrew Kempf, 1090 Julia St., Elizabeth, N. J.
2 BZX Herman Wolbarst, 299 East 8th St......New York City
2 BZY R. W. Hartman, 203 East 175th St......Bronx, N. Y.
2 BZZ William Owens, 1435 54th St........Brooklyn, N. Y.

2 CAA Alan MacDonough, 1186 Madison Ave...New York City
2 CAB Charles Miller, 379 Avenue E..........Bayonne, N. J.
2 CAC A. Winterhalter, 863 Delafield Ave..Staten Island, N. Y.
2 CAD Emil Spisak, 52 East 24th St.........Bayonne, N. J.
2 CAE C. E. Litchfield, 261 North 19th St., East Orange, N. J.
2 CAF William W. Crosby, 542 West 124th St..New York City
2 CAG Victor E. Paterno, 536 56th St.......Brooklyn, N. Y.
2 CAH Llewelyn L. B. Summers.....Whitestone, Queens, N. Y.
2 CAI Tiber Drug Co. (John Nutley, Opr.), 387 Fulton St.,
Jamaica, N. Y.
2 CAJ H. Ross-Clunis, 260 Oakwood Ave., West New Brighton, N. Y.
2 CAK George Matthew Moehren, 2039 Creston Ave., Bronx, N. Y.
2 CAL Standard Electric Co. (H. Lubinsky, Opr.),
41 South Orange Ave., Newark, N. J.
2 CAM August Harms, 210 Church St.........Freeport, N. Y.
2 CAN John Johnson, 149 Robinson Ave.......Newburg, N. Y.
2 CAO Not assigned.
2 CAP J. B. Ferguson, Ship Owners' Radio Serv., Inc.,
80 Washington St., New York City
2 CAQ C. M. Sherwood, Ship Owners' Radio Serv., Inc.,
724 Carroll St., Brooklyn, N. Y.
2 CAR Louis F. Gray, Ship Owners' Radio Serv., Inc.,
60 Burgess Pl., Passaic, N. J.
2 CAS Charles E. Maps, Ship Owners' Radio Serv., Inc.,
178 Woodworth Ave., Yonkers, N. Y.
2 CAT R. J. Ketcham, Ship Owners' Radio Serv., Inc.,
1098 Woodycrest Ave., New York City
2 CAU W. J. Roche, Ship Owners' Radio Serv., Inc.,
821 Foster Ave., Brooklyn, N. Y.
2 CAV E.S.Guilford, Main St., P.O.Box 224, Farmingdale, N. J.
2 CAW Wallace John Cronin, 123 Bruno St., Schenectady, N. Y.
2 CAX Leslie Cramer, 158 Nielson St....New Brunswick, N. J.
2 CAY Edwin G. Compton, 117 Branch Ave...Red Bank, N. J.
2 CAZ Henry Michalovich, 299 Francis Ave..Schenectady, N. Y.

2 CBA Bertram S. Bickelhaupt, 376 E. 162nd St..Bronx, N. Y.
2 CBB Kenneth S. Coyle, Maple Ave., Box 234, R.F.D. No. 7,
Alplaus, Schenectady, N. Y.
2 CBC Ambrose Adamski, 425 Cutler St....Schenectady, N. Y
2 CBD Harold Payne, 1064 Mary St.........Elizabeth, N. J.
2 CBE A. Edward Shuster, 510 Adams Ave....Elizabeth, N. J.
2 CBF Herbert C. Tetley, 129 33rd St.......Brooklyn, N. Y.
2 CBG Montgomery Radford, 419 Warburton Ave..Yonkers, N. Y.
2 CBH Edward John Richter, 107 Conselyea St., Brooklyn, N. Y.
2 CBI Alf. C. Stevens, 150 No. Terrace Ave..Mt. Vernon, N. Y.
2 CBJ Henry A. Stainken, 6916 10th Ave....Brooklyn, N. Y.
2 CBK Hudson City Radio Club (V. J. Gilcher, Opr.),
37 Sherman Ave., Jersey City, N. J.
2 CBL Frederick Charles Meyer, 25 Oxford St., Montclair, N. J.
2 CBM Joseph Weiss, 230 East 87th St.......New York City
2 CBN H. M. Steele, 130 Columbus Ave., Rockville Centre, N. Y.
2 CBO Fred Rosebury, 12 Fourth St.......Weehawken, N. J.
2 CBP Gunard C. Hapberg..226 West 1st Ave., Roselle, N. J
2 CBQ Daniel D. Schneeweis, 3807 12th Ave..Brooklyn, N. Y.
2 CBR Maurice J. Herald, 201 Avon Ave......Newark, N. J.
2 CBS Stephen Reich, 263 Vermont St........Brooklyn, N. Y

2 CBT Fred Cost, 139 Main St............South River, N. J.
2 CBU John Gluck, 1709 Park Ave............New York City
2 CBV Orel D. Orvis, Jr., 16 Leo Pl..........Newark, N. J.
2 CBW William F. Joho, 525 Adams Ave....Elizabeth, N. J.
2 CBX J. E. Tribby, 29 Morning Star Rd..Port Richmond, N. Y.
2 CBY William T. Baxter, 171 West 89th St...New York City
2 CBZ Hubert Marshall Taylor, 568 Highland Ave..Clifton, N. J.

2 CCA Isidore Spiegler, 870 East 175th St......Bronx, N. Y.
2 CCB James Hartvig, Jr., 458 First St......Brooklyn, N. Y.
2 CCC Frank Holi, 1529 Hoe Ave..............Bronx, N. Y.
2 CCD Not assigned.
2 CCE Electrical Industries Mfg. Co. (E. Condon, Opr.), 222 80th St., Brooklyn, N. Y.
2 CCF Electrical Industries Mfg. Co. (E. Condon, Opr.), 326 W. 41st St., New York City
2 CCG Bruce G. Kirk ....Oceanport, N. J.
2 CCH Harry William Youngdahl, 969 55th St., Brooklyn, N.Y.
2 CCI Francis Gully, 54 Mackay Pl.........Brooklyn, N. Y.
2 CCJ Edgar M. Wilson, 224 Garden St.......Hoboken, N. J.
2 CCK Victor Woodward, 370 West 116th St....New York City
2 CCL Not assigned.
2 CCM Bernard Henry Trinkaus, 496 E. 138th St., Bronx, N. Y.
2 CCN Fred. L. Cummings, Jr., 236 Jeffrey Ave., Jamaica, N. Y.
2 CCO Harry J. Snyder, 26 Nuttman Pl....West Orange, N. J.
2 CCP Elizabeth Automobile Co. (F. Havens, Opr.), 14-16 Westfield Ave., Elizabeth, N. J.
2 CCQ V. A. Bohman, 56 Prospect St...Long Island City, N. Y.
2 CCR Robert A. Meier, Horton Ave..........Lynbrook, N. Y.
2 CCS William H. Muller, Jr., 444 67th St...Brooklyn, N. Y.
2 CCT Horatio D. W. McClure, 302 W. 79th St..New York City
2 CCU Frank Barker, 163 Madison Ave........Clifton, N. J.
2 CCV Solomon Augstreich, 1669 Park ave......New York City
2 CCW Elmore J. Brower, 296 17th Ave........Newark, N. J.
2 CCX Charles A. Feltman, 1000 Surf Ave....Brooklyn, N. Y.
2 CCY E. F. Kerrigan, 218 West Post Rd., Mamaroneck, N. Y.
2 CCZ George H. Benjamin, R. F. D. No. 6, Elizabeth St., Schenectady, N. Y.

2 CDA George L. Winne, 10 Swan St......Schenectady, N. Y.
2 CDB Chas. Fred. Fuller, 516 Pleasant St., Schenectady, N. Y.
2 CDC Polytechnic Institute (H. R. Mimno, Opr.), Russell Sage Laboratory, Troy, N. Y.
2 CDD Andrew Schneider, 216 Sixth Ave....Schenectady, N. Y.
2 CDE Leslie G. Vail, Vincent St..............Orient, N. Y.
2 CDF Thomas F. McGrath, Jr., 48 No Fairview Ave., Hammels, Rockaway Beach, N. Y.
2 CDG Leland C. Wessel, 204 4th Ave......Schenectady, N. Y.
2 CDH Joel B. Ennis, Jr., Van Buren Ave.....Castleton, N. Y.
2 CDI George T. Parker, Kings Highway......Middleton, N. Y.
2 CDJ T. T. Jeffers, Schenectady Teachers Training School, Schenectady, N. Y.
2 CDK Walton E. Truran, 33 Lincoln Terr......Yonkers, N. Y.
2 CDL Philip W. Ramig, Jr., 269 18th St....Brooklyn, N. Y.
2 CDM Charles Hurd, 36 Clairmont Ave..........Verona, N. J.
2 CDN Adelphi Academy (R. Burhans & W. M. Perry, Oprs.), 262 Lafayette Ave., Brooklyn, N. Y.
2 CDO H. J. Preble, Morgan Ordnance Dept., So. Amboy, N. J.
2 CDP Jacob H. Mason, 1601 Bedford Ave.....Brooklyn, N. Y.
2 CDQ Chas. F. Boynton, 129 Engle St......Englewood, N. J.
2 CDR Milton E. Walker, Jr., 121 Johnson Ave., Newark, N. J.
2 CDS Chester R. Underhill, 35 Hillside Ave...Montclair, N. J.
2 CDT Joseph M. McInturff, 428 Greene Ave...Brooklyn, N. Y.
2 CDU Theodore Reith, 330 Parkhill Ave.......Yonkers, N. Y.
2 CDV New Jersey Radio Supply Co. (J. Prengle, Opr.), 324 Harrison Ave., Harrison, N. J.
2 CDW Robert Greenberg, 420 Hillside Ave......Jamaica, N. Y.
2 CDX Wm. Hotine, 72 Laurence St..........Flushing, N. Y.
2 CDY George Solomon, 9 West 31st St........Bayonne, N. J.
2 CDZ John R. Meagher, 343 E. 195th St.....New York City

2 CEA H. Mackert, 10772 Greenwood Ave., Richmond Hill, N. Y.
2 CEB Nassau Radio League (J. M. Joyce, Opr.), Lincoln and Jay Sts., Freeport, N. Y.
2 CEC Benjamin F. Orange, 922 Leggett Ave.....New York City
2 CED Gustave F. Shorey, Apaquoge Rd....Easthampton, N. Y.
2 CEE Walter H. Bostwick, 1334 Putnam Ave..Plainfield, N. J.
2 CEF Edward Koffman, 118 Cedar Ave........Newark, N. J.
2 CEG Howard A. Chinn, 210 W. 102nd St....New York City
2 CEH Percy B. Willis, 1732 Melville St.......New York City
2 CEI Robert Kraus, Fish Ave, north of Pelham Pkway, N. Y.
2 CEJ C. W. Woodford, 34 Washington Ave., Cedarhurst, N. Y.
2 CEK Gilbert H. Robert, Jr., 78 Washington Ave., Cohoes, N. Y.
2 CEL Harry Milton Harvey, 617 Crane St., Schenectady, N. Y.
2 CEM Sanford L. Hirschberg, 572 Morris St.....Albany, N. Y.
2 CEN Sherman Dennis, Jr., 705 Broadway..Long Branch, N. J.
2 CEO John H. Cornwall, Barkers Point, Ft. Washington, N. Y.
2 CEP Chester C. Lloyd, 135 12th St.............Troy, N. Y.
2 CEQ Sanford D. Ashford, 128 Branch Ave....Red Bank, N. J.
2 CER Clarence B. Smith, 610 St. Marks Ave..Westfield, N. J.
2 CES Fred J. Roach, 3044 Kings Bridge Ave., New York City
2 CET Wm. LaForge, 421 72nd St...........Brooklyn, N. Y.
2 CEU John Rippe, 432 Bainbridge St........Brooklyn, N. Y.
2 CEV Jack Pascal, 85 Sherman Ave......Tompkinsville, N. Y.
2 CEW John B. May, 26 W. 6th St...........Bayonne, N. J.
2 CEX Charles Fenz, 310 W. 123rd St........New York City
2 CEY H. G. Gesswein, 221 Sherman Ave....Roselle Pk., N. J.
2 CEZ George Baumann, 456 4th St..........Hoboken, N. J.

2 CFA Clarence A. Kelting, 205 Midwood St....Brooklyn, N. Y.
2 CFB Floyd M. Wiese, 545 Muriel Pkway.....Elizabeth, N. J.
2 CFC Gustave Nacciarone, 271 Union St......Brooklyn, N. Y.
2 CFD Warner Cosgrove ....Upper Mountvale, N. J.
2 CFE George W. Korper, 639 E. 18th St.....Brooklyn, N. Y.
2 CFF R. W. Lindstrom, 118 33d St. Woodcliffe-on-Hudson, N. J.
2 CFG Oswald F. Judisch, 10941 109th St..Woodhaven, N. Y.
2 CFH Charles G. Rosewald, 93 Flatbush Ave....Brooklyn, N. Y.
2 CFI Elwood K. Morse, 21 Union Pl.........Yonkers, N. Y.
2 CFJ Mark Rothkopf, 35 W. 114th St........New York City
2 CFK W. M. Bishop, R.F.D. No. 7, Alplaus, Schenectady, N. Y.
2 CFL Ray Hoyt ....Glendola, N. J.
2 CFM Lee A. Durfee, 344 Hegeman St......Schenectady, N. Y.
2 CFN Grant N. Colket, 6 Mercer St............Albany, N. Y.
2 CFO Martin Bender, 2208 7th Ave............New York City
2 CFP Max S. Shulsinger, 902 Myrtle Ave.....Brooklyn, N. Y.
2 CFQ Arthur Williams, 73 South Arlington Ave..Orange, N. J.
2 CFR Samuel Schneider, 1030 Hoe Ave...........Bronx, N. Y.
2 CFS Edward Barth, 69 Woodbine St.........Brooklyn, N. Y.
2 CFT Livingston Swentzel, 49 Slocum Pl...Long Branch, N. J.
2 CFU Albert J. Higson, 84 Romaine Ave....Jersey City, N. J.
2 CFV David M. Waters, 75 Astor Pl........Jersey City, N. J.
2 CFW Alfred Feldman, 1365 Clay Ave.........New York City
2 CFX Arthur W. Pfaff, 525 First St.........Westfield, N. J.
2 CFY Robert M. Wright, 1527 Central Ave....Westfield, N. J.
2 CFZ Samuel R. Goodwin, 1920 Anthony Ave...New York City

2 CGA C. F. Nelson, 33 Castleton Ave....Tompkinsville, N. Y.
2 CGB Edward H. Tukey, 193 Park St.........Ridgefield, N. J.
2 CGC George Rotkowitz, 700 W. 178th St......New York City
2 CGD Clarence Deim.................... Water Mill, N. Y.
2 CGE R. Martin Kessler, Castle Heights Ave., Up. Nyack, N. Y.
2 CGF Huyler B. Ellison, 41 Wallace St.......Freeport, N. Y.
2 CGG Harry J. McCollum, 130 Second Ave..Long Branch, N. J.
2 CGH Mahlon Brush, 45 Pine Ave............Albany, N. Y.
2 CGI Elmer S. Carter, 922 Crane St......Schenectady, N. Y.
2 CGJ Frank Dusenski, Jr., 614 Blaine St., Schenectady, N. Y.
2 CGK C. E. Goodwin, 78 Mt. Hermon Way, Ocean Grove, N. J.
2 CGL Charles Leon Girardot, 62 Third Ave..Schenectady, N. Y.
2 CGM G. S. Hannell, R.F.D. No. 1, Shore Rd., Colonie, N. Y.
2 CGN William Bryan, Jr., 248 So. Lincoln Ave., Elberon, N. J.
2 CGO Samuel C. Morrell, Raritan Arsenal.....Metuchen, N. J.
2 CGP Louis F. Keating, 67 William St......Belleville, N. J.
2 CGQ Herbert G. Messer, 392 Sairs Ave.....Long Branch, N. J.
2 CGR Robert Birnn, Jr., Box 373..........Park Ridge, N. J.
2 CGS Max J. Weiner, Cor. Elm & Grove Sts, E. Paterson, N. J.
2 CGT Fred. W. Marshall, 607 McNeil Ave., Hempstead, N. Y.
2 CGU Gustave J. Ulrich, 448 East 145th St...New York City
2 CGV Isidore M. Argush, 59 Eldorado Pl....Weehawken, N. J.
2 CGW Harold K. Cadmus, R.F.D. No. 1...Hackensack, N. J.
2 CGX Simon Kahn, 941 St. John Ave..........Bronx, N. Y.
2 CGY Joseph Lyman, 34 Remsen St..........Brooklyn, N. Y.
2 CGZ Gene E. Witham, 126 86th St.........Brooklyn, N. Y.

2 CHA F. C. Brockman, 81 Robinson St.....Schenectady, N. Y.
2 CHB George Brauer, 9 Cottage Pl..........Englewood, N. J.
2 CHC Harold Johnson, 630 McLean Ave.......Yonkers, N. Y.

Third District

3 BEL Robert O. Hartman, 703 Clifton Ave.....Collingdale, Pa.
3 BEM Charles A. Sauerwin, 35 S. 9th St......Allentown, Pa.
3 BEN James M. Saddington, 510 Oak Lane.......Phila., Pa.
3 BEO D. Keller, Cor. Broad & Main Sts..Trumbauersville, Pa.
3 BEP Albert E. Cowell, 38 S. 12th St..........Easton, Pa.
3 BEQ E. Bruce, 731 Rock Creek Church Rd., Washington, D. C.
3 BER John A. Pool, 114 Montgomery Ave......Ardmore, Pa.
3 BES Henry Lehmberg, 3832 N. Percy St........Phila., Pa.
3 BET Merle Hilborn, 133 61st St...............Phila, Pa.
3 BEU Charles H. Howson, Jr., 134 Walnut Ave....Wayne, Pa.
3 BEV John H. Rushton, 112 Runnymede Ave......Wayne, Pa.
3 BEW Clifford H. Oakley, 932 Riverside Ave....Trenton, N. J.
3 BEX Frank V. Vogel, Third St...........West Easton, Pa.
3 BEY Rollin Jones, 940 N. Front St...........Reading, Pa.
3 BEZ Harry J. McWade, 26 Hillcrest Rd......Watchung, N. J.

3 BFA T. G. Borden, 1215 Newton St., N.E., Washington, D. C.
3 BFB Portsmouth Y.M.C.A., 925 High St....Portsmouth, Va.
3 BFC Henry F. Stoughton, 1907 Girard Ave......Phila., Pa.
3 BFD Edwin Miller, 6036 Locust St............Phila., Pa.
3 BFE Clarence B. Lewis ....Proffit, Va.
3 BFF Lawrence Cubberley, 80 Hudson St......Trenton, N. J.
3 BFG Caleb Phipps, 20 Hillside Ave..........Ventnor, N. J.
3 BFH David Stretch, 207 Academy St.........Trenton, N. J.
3 BFI Alfred J. Seeley, 8 Ohio Ave.......Atlantic City, N. J.
3 BFJ Watson M. Corson, 251 W. Calpier St.......Phila., Pa.
3 BFK Alfred H. Miller, 6439 Jefferson St.........Phila., Pa.
3 BFL Louis W. Moxey, 7437 Sprague St..........Phila., Pa.
3 BFM Henry P. Gilbert, Jr., 723 Emmet St...Portsmouth, Va.
3 BFN Frank B. Uphoff, 1335 Kerbaugh St.........Phila., Pa.
3 BFO C. E. McFadden, Jr., 114 Jackson St...Collingdale, Pa.
3 BFP Walter F. Paca, 3529 Ella St..............Phila., Pa.
3 BFQ Nicholas C. Henwood, 717 So. 63rd St.......Phila., Pa.
3 BFR Julius Brodman, 1959 Patton St...........Phila., Pa.
3 BFS Frederick L. Myers, 234 Atlantic St....Bridgeton, N. J.
3 BFT Harold I. Polhemus, 504 S. Main St..Hightstown, N. J.
3 BFU M. G. McCoy, 19th & Atlantic Aves...Longport, N. J.
3 BFV Russell S. Ohl ....Robesonia, Pa.
3 BFW J. J. Whelan, 8 S. Montpelier Ave..Atlantic City, N. J.
3 BFX Carl J. Wenzinger, 3135 N. Front St.......Phila., Pa.
3 BFY Norman R. Evans, R.F.D. No. 1........Glassboro, N. J.
3 BFZ Roy Ward, 500 Morton St...........Ridley Park, Pa.

3 BGA Walter K. Hoffman, New St..........Freemansburg, Pa.
3 BCB Harry W. Money, 5042 Ogden St............Phila, Pa.
3 BGC Page W. Kille, Elm St..............S. Westville, N. J.
3 BGD Samuel Spitler, 17 Huntington St..Rutherford Hgts, Pa.
3 BGE Norman Kramer, Main & Tioga Sts..Rutherford Hgts, Pa.
3 BGF Earl E. Kline, 144 E. Philadelphia St.......York, Pa.
3 BGG Russel E. Fichty, 320 W. York Ave..........York, Pa.
3 BGH Richard Burgard, 310 N. West St............York, Pa.
3 BGI George Stevens, 140 Paris St.......Sea Isle City, N. J.
3 BGJ Isaac E. Brandt, 823 Walnut St.........Lebanon, Pa.
3 BGK Paul S. Fox, Cor. 6th & East Sts....West Easton, Pa.
3 BGL Theodore G. Koven ....Denville, N. J.
2 BGM Louis L. Scribner ....Earleysville, Va.
3 BGN Alfred Matthews, Jr., 210 6th St., West Cape May, N. J.
3 BGO Howard Adams, Jr.............................Jessup, Md.
3 BGP Norman M. Brooks, 9 Fayette St........Staunton, Va.
3 BGQ Russell H. Emley, 867 E. State St.....Trenton, N. J.
3 BGR Paul A. Sweeney, 40 Lincoln St........Hampton, Va.
3 BGS John P. Hyde ....Bristown, Va.
3 BGT C. S. Risley, Rumson & Ventnor Aves., Atlantic City, N. J.
3 BGU Maurice W. Sloan, Jr., 23rd Ave........Longport, N. J.
3 BGV Percy G. Clice, 20 Front St..........Cumberland, Md.
3 BGW Stuart M. Barnette, 203 N. State St.......Dover, Del.
3 BGX Leonard S. Jones, 333 Locust St........Hampton, Va.
3 BGY Paul T. Hastings, E. 27 Bldg........Camp Meade, Md.
3 BGZ C. M. Gilbert, 3rd, 350 Haddon Ave..Collingswood, N. J.

3 BHA Harold G. Creig, 822 Broad St........Collingdale, Pa.
3 BHB Jack Alter, 2739 N. 5th St...............Phila., Pa.
3 BHC Wm. H. Reith, 4913 Ogden St............Phila., Pa.
3 BHD John A. Bullock, Jr., Post Rd............Trainer, Pa.
3 BHE John E. Phillips, 911 Market St....Marcus Hook, Pa.
3 BHF Charles Hutchinson, 1128 Tree St..........Phila., Pa.
3 BHG Wm. P. Walter, 1938 E. Chelten Ave......Phila., Pa.
3 BHH Abraham R. Libby, 2735 Fifth St..........Phila., Pa.
3 BHI Ray H. Zeigler, 1115 State St.........Harrisburg, Pa.
3 BHJ Albert J. Hasson, Box No. 2...........Green Lane, Pa.
3 BHK R. Strayer, R.F.D. No. 6, Burl'gt'n Ave., Bridgeton, N. J.
3 BHL Fred T. Bradley, St. George Ave..........Crozet, Va.
3 BHM H. H. Waesche, 6105 4th St., N.W., Washington, D. C.
3 BHN Earl W. Preston, 38 High St...........Trenton, N. J.
3 BHO H. P. Bryant, 304 Rittenhouse St. ..Washington, D. C.
3 BHP Robert F. Gerbrick, 2118 Hicks St..........Phila., Pa.
3 BHQ Norman J. McCabe, 716 Powell St.....Gloucester, N. J.
3 BHR Alfred L. Elliott, 27 Summit Ave...N. Plainfield, N. J.
3 BHS Peter T. Perdue, 718 Delaware St.........Salem, Va.
3 BHT Wilson T. McClanen, 6122 Musgrave St.....Phila., Pa.
3 BHU Frank Masho, Charles St...............Oak View, Pa.
3 BHV R. E. Banker, 300 11th St., N.E. ..Washington, D. C.
3 BHW George E. Owens, 430 39th St.......West Phila., Pa.
3 BHX Arthur F. Ruff, 411 Ingleside Ave.....Catonsville, Md.
3 BHY James N. Williams, 2327 Hanover St....Richmond, Va.
3 BHZ Edward Eisele, Jr., 4941 N. Second St. ..Phila., Pa.

3 BIA John H. Wild, Box 605, State St........Newtown, Pa.
3 BIB Maurice H. Griscom ....Neshanic, N. J.
3 BIC Charles K. Krause, 1912 Market St....Harrisburg, Pa.
3 BID Ashby L. Groves ....Brooke, Pa.
3 BIE George J. Gross, 916 E. North Ave.....Baltimore, Md.
3 BIF John C. Holtby, 39 Lincoln St.........Lansdowne, Pa.
3 BIG John Hays, Jr., West High St............Carlisle, Pa.
3 BIH H. Wilbur Brown, 5203 N. 11th St........Phila. Pa.
3 BII Albert Bowers, 625 E. Chestnut St..........York, Pa.
3 BIJ Walter R. Selden, 201 E. Franklin St...Richmond, Va.
3 BIK Clayton A. Smith, 66 S. Bridge St....Somerville, N. J.
3 BIL John E. Keene, 128 Walnut St.......Mount Clare, Pa.
3 BIM Harry N. G. Kline, 2916 N. 16th St.......Phila., Pa.
3 BIN Louis R. Enslin, 1731 N. 21st St.........Phila., Pa.
3 BIO Edward Poist, 51 E. Randall St.......Baltimore, Md.
3 BIP Penn. Military College, East 14th St......Chester, Pa.
3 BIQ John E. Armstrong, 5456 Delancey St......Phila., Pa.
3 BIR Elwood L. Clemmer, 642 Haws Ave.....Norristown, Pa.
3 BIS Arthur Lovett, 412 Bank St..........Cape May, N. J.
3 BIT Samuel E. Fraim, Jr., 802 N. Duke St...Lancaster, Pa.
3 BIU Otis Minnick, 42 Fairview Ave.......Cumberland, Md.
3 BIV Elwood Leminger, 820 Elm St...........Reading, Pa.
3 BIW Henry K. Kappel, 2826 N. Warnock St......Phila., Pa.
3 BIX Earl W. Furlow, 238 N. Mulberry St...Lancaster, Pa.
3 BIY Francis E. Maddox, 106 Church Ave......Roanoke, Va.
3 BIZ Henri G. Omwake, 440 College Ave......Lancaster, Pa.

3 BJA Bayard P. Fonda ....Sudbrook Park, Md.
3 BJB John P. M. Haas, 1538 W. Lanvale St..Baltimore, Md.
3 BJC Roy C. Pelham, 1224 Harrison St..........Phila., Pa.
3 BJD John H. Lunnemann, 2950 Germantown Ave..Phila., Pa.
3 BJE Shirley B. Knapp, Edgewood Arsenal.....Edgewood, Md.
3 BJF J. E. Crowley, 25 S. California St..Atlantic City, N. J.
3 BJG Elmer Bishop, 2410 N. 18th St...........Phila., Pa.
3 BJH Benjamin Bartolet, 2d, 2112 Columbia Ave...Phila., Pa.
3 BJI Orion G. Albert, 667 Preston St...........Phila., Pa.
3 BJJ Milton Morse, 229 N. Broad St........Trenton, N. J.
3 BJK James W. Burn, 203 W. 24th St..........Chester, Pa.
3 BJL F. A. Horning, 255 N. Main St...........Telford, Pa.
3 BJM Howard B. Allen, Jr., 63 E. Hortter St......Phila., Pa.
3 BJN John F. Fluehr, 104 Susquehanna St., W.....Phila., Pa.
3 BJO Leroy Ritter, 2415 S. Sartain St...........Phila., Pa.
3 BJP William B. Atmore ....Clementon, N. J.
3 BJQ George L. Cook ....Woodmont, Pa.
3 BJR Arthur K. Ransom ....Rehoboth Beach, Del.
3 BJS F. L. Steinbright, 636 Stanbridge St. ..Norristown, Pa.
3 BJT John B. Dickel, 710 East End Ave.......Lancaster, Pa.
3 BJU Floris C. Van Reuth, 5210 Harford Rd., Baltimore, Md.
3 BJV Wm. H. Field, 109 W. Mulberry St., Pleasantville, N. J.
3 BJW H. O. Bixby, Lieut. C.A.C., Sherwood Inn., Ft. Monroe, Va.
3 BJX John R. Reiner, 704 East End Ave......Lancaster, Pa.
3 BJY Robert J. Littler, 5856 Windsor St.........Phila., Pa.
3 BJZ Merrill W. Darcey, 4843 Wisconsin Ave., Wash., D. C.

3 BKA Maj. J. H. Clinton, 124 N. Iowa Ave., Atlantic City, N. J.
3 BKB George Selser, Jr., 51 Colonial St......Trenton, N. J.
3 BKC H. W. Yates, 920 G St., S.W. .....Washington, D. C.
3 BKD A. P. Demaray, Jr., 70 Eastern Ave., Somerville, N. J.
3 BKE Ferdinand A. Berger, 53 Lewis Ave...E. Lansdowne, Pa.
3 BKF R. E. Pulaski, 1034 Liberty St........Camden, N. J.
3 BKG Charles E. Bream, 504 W. Atlantic Ave..Audubon, N. J.
3 BKH Samuel Gross, 1227 Seventh St............Phila., Pa.
3 BKI Richard R. Halpenny, 165 V St., N.E....Wash., D. C.
3 BKJ John A. Mills, 421 Walnut St..........Lebanon, Pa.
3 BKK John H. Arthur, 16 Main St..........Millville, N. J.
3 BKL Kenneth L. Blamey, 403 W. North Ave.......York, Pa.
3 BKM Virgil M. D. Marcy, 2647 Westfield Ave..Camden, N. J.
3 BKN William P. Wilson, 702 N. Queen St....Lancaster, Pa.
3 BKO Charles E. Rauch, 941 Cumberland St....Lebanon, Pa.
3 BKP John C. Racona, 1112 Daly St.............Phila., Pa.
3 BKQ Haverford Township High School Radio Club, Eagle Road, Oakmont, Pa.
3 BKR William J. Duffy, Villanova College......Villanova, Pa.
3 BKS James Doyle, 712 Walker Ave..........Twoson, Md.
3 BKT D. B. Johannes, 6125 Georgia Ave., N.W., Wash., D. C.
3 BKU Robert W. Andrews, 1749 Park Rd........Wash., D. C.
3 BKV John P. Miller, 216 S. 10th St............Phila, Pa.
3 BKW Brewster H. Marshall, 3363 18th St., N.W., Wash, D. C.
3 BKX William A. T. Overstreet, 145 W. Main St..Salem, Va.
3 BKY Lloyd M. Knoll, 6120 Carpenter St..........Phila., Pa.
3 BKZ Kenneth Parks, 121 York St ....Bridgeton, N. J.

3 BLA Raymond O. Riffle, Frederick St.........Pittletown, Pa.
3 BLB Elwood C. Botte, 231 N. 4th St..........Reading, Pa.
3 BLC Floyd J. Rice, 1519 Shipman St.......Bethlehem, Pa.
3 BLD Clarence F. Holsopple, 27 Main St.....Quakertown, Pa.
3 BLE Murril W. Hilderth, 107 Pine St......Bridgeton, N. J.
3 BLF C. Russ Hofmann, 202 Addison St......Richmond, Va.
3 BLG Thomas S. McCaleb, 717 Redgate Ave.....Norfolk, Va.
3 BLH William D. Pratt, 1901 12th St............Phila., Pa.
3 BLI Charles H. Hess, 2122 N. Uber St..........Phila., Pa.
3 BLJ J. C. Schwartz, 1837 E. Lafayette Ave., Baltimore, Md.
3 BLK Haddonfield High School, Lincoln & Chestnut Sts., Haddonfield, N. J.
3 BLL John H. Shephard, Jr., 2252 N. Lambert St., Phila., Pa.
3 BLM Anthony S. Bilotta, 1418 Ellsworth St......Phila., Pa.
3 BLN Philip Shapiro, 2606 S. Jessup St.........Phila., Pa.
3 BLO William Gimpel, 1515 Ritner St...........Phila., Pa.
3 BLP Donald E. Wilbur, 728 Delaware Ave....Bethlehem, Pa.
3 BLQ Harold Treloar ....Cornwall, Pa.
3 BLR Earl W. Dannals, 2708 S. 10th St.........Phila., Pa.
3 BLS Gaetano A. P. DiMeo, 1544 McKean St.....Phila., Pa.
3 BLT John McLaughlin, 2953 Boudinot St........Phila., Pa.
3 BLU Lyman D. Warner, 10 Millbrook Ave....Haverford, Pa.

3 BLV	Peter A. DeLuck, 219 W. 8th St	Wilmington, Del.
3 BLW	Clarence A. Addis, 233 W. Pine Ave	Wildwood, N. J.
3 BLX	Fred T. Baker, 802 Winston Ave	Baltimore, Md.
3 BLY	Harold R. David, 656 Linden Ave	York, Pa.
3 BLZ	Franklyn J. Wolff, 600 Ingham Ave	Trenton, N. J.
3 BMA	Leonard Mayers, 3809 Hollybeach Ave	Wildwood, N. J.
3 BMB	Alton R. Bowen, 15 Greenway St	Pleasantville, N. J.
3 BMC	Herbert N. Laird, 233 N. Broad St	Trenton, N. J.
3 BMD	Paul Gephart, 121 Gay St	Phoenixville, Pa.
3 BME	Arnold Goldberger, 1842 17th St	Phila., Pa.
3 BMF	William Morrison, 2684 Amber St	Phila., Pa.
3 BMG	C. P. Burt, Cor. 2d & Poplar Sts	Moorestown, Pa.
3 BMH	Ervin Seltzer, 1857 N. 17th St	Phila., Pa.
3 BMI	Karl F. Klingelhoeffer, 916 Belmont Ave	Phila., Pa.
3 BMJ	Geo. R. Lenhert, Jr., 4013 Spring Garden St.,	Phila., Pa.
3 BMK	Claude V. Lyon, 5308 Haverford Ave	Phila., Pa.
3 BML	A. LaMont Burst, 3730 35th St	Mt. Rainier, Md.
3 BMM	Donovan Geyer, 112 8th St	Reading, Pa.
3 BMN	Raymond J. Carr, 617 Union Ave	Petersburg, Va.
3 BMO	G. T. Phillips, Jr., 210 Goodwood Gardens,	Baltimore, Md.
3 BMP	John J. Guinan, 2303 Thompson St	Phila., Pa.
3 BMQ	Jesse H. Naylor, Erial Rd	Clemanton, N. J.
3 BMR	Andrew J. Thornber, 1855 N. 28th St	Phila., Pa.
3 BMS	George F. Hall, 133 E. Gorgas Lane	Phila., Pa.
3 BMT	Harold B. Stott, 4325 Otter St	W. Phila., Pa.
3 BMU	James W. Bayless, 239 Hook Rd	Sharon Hill, Pa.
3 BMV	Clarence I. Chapman, 1610 Waverly St	Phila., Pa.
3 BMW	Frank J. Holzheimer, 5167 Ogden St	Phila., Pa.
3 BMX	Joseph H. Mallon, 143 Gorgas Lane	Phila., Pa.
1 BMY	Clifford Bates, 928 Pearl St	Camden, N. J.
3 BMZ	Gilbert Knapp, Jr., 948 Linden St	Camden, N. J.
3 BNA	Frederick Teal, 5327 Parrish St	Phila., Pa.
3 BNB	Ernest Waterhouse, 4924 Fairhill St	Phila., Pa.
3 BNC	William A. Bramhall, 2102 H St., N.W.	Wash., D. C.
3 BND	Charles R. Rowe, 646 Lexington Pl	Wash, D. C.
3 BNE	Henry Kroskin, 1044 Highland Ave	Norfolk, Va.
3 BNF	Herbert W. Squires	Fort Monroe, Va.
3 BNG	Arthur E. Poorman, 168 Second St	Highspire, Pa.
3 BNH	Clifford C. Baker	Quakertown, Pa.
3 BNI	Ernest R. Kimball, Box No. 147	Branchville, N. J.
3 BNJ	Willie R. Graves, 103 S. Dover St.,	Atlantic City, N. J.
3 BNK	C. Bernard Keinard, 373 Second Ave	Phoenixville, Pa.
3 BNL	John W. Fullmer, 130 S. 10th St	Easton, Pa.
3 BNM	Robert M. Kasey, 322 Main St	Salem, Va.
3 BNN	Eugene Bossieux, 3002 Broad St	Richmond, Va.
3 BNO	Jean L. Tower, 35 E. State St	Trenton, N. J.
3 BNP	E. Rossiter Fait, 343 High St	Pottstown, Pa.
3 BNQ	Warren G. Armstrong, 333 High St	Pottstown, Pa.
3 BNR	Elmer Middleton, Jr., 40 West End Ave	Trenton, N. J.
3 BNS	Philip S. Klein, 548 W. James St	Lancaster, Pa.
3 BNT	Asher E. Dennis, 1314 Ferry St	Easton, Pa.
3 BNU	Oscar A. Hiskey, 22 W. Fairview St	Bethlehem, Pa.
3 BNV	William H. Clark, 236 Speedwell Ave	Morristown, N. J.
3 BNW	John E. Rawlinson, 244 Water St	York, Pa.
3 BNX	Douglas E. Hunt, 639 Belmont St	Easton, Pa.
3 BNY	George S. Townsley, 331 W. Main St	New Holland, Pa.
3 BNZ	Joseph Mazerski, 1622 Clement St	Baltimore, Md.
3 BOA	George R. McMahon, 5028 Ogden St	Phila., Pa.
3 BOB	Howard J. Gibson, Rolling & State Sts.,	Springfield, Pa.
3 BOC	Clark Taylor, Bonne Brae Farm	Langhorne, Pa.
3 BOD	George F. Fennell, 107 E. Haines St	Phila., Pa.
3 BOE	Walter Schryer, 1504 Louden St	Phila., Pa.
3 BOF	Edgar Harrison, 1006 Cameron St	Alexandria, Va.
3 BOG	Thomas H. Magness, Jr., 14 E. Read St	Baltimore, Md.
3 BOH	Armand F. Jones, 3006 Pacific Ave.,	Atlantic City, N. J.
3 BOI	Al. R. Eaches, Gay & Griffin Sts	Phoenixville, Pa.
3 BOJ	Orlando C. Smith, 24 Eighth St	Quakertown, Pa.
3 BOK	George E. Hower, 64 Wall St	Bethlehem, Pa.
3 BOL	Walter Little, 2321 Hicks St	Phila., Pa.
3 BOM	George E. Schmutz, 1925 N. Croskey St	Phila., Pa.
3 BON	Nunzio Sorrentino, 819 Scars St	Phila., Pa.
3 BOO	Louis Treen, 2125 N. Fifth St	Phila., Pa.
3 BOP	Louis W. Zindel, Berlin Rd	Clemanton, N. J.
3 BOQ	Alan P. Fort, 414 W. Stafford St	Germantown, Pa.
3 BOR	G. M. Upton, 46 W. Washington St.,	Germantown, Pa.
3 BOS	Carl J. Mondrosch, 2430 Seybert St	Phila., Pa.
3 BOT	Milton H. Low, 931 Point St	Camden, N. J.
8 BOU	Edward M. Werner, 2036 Russell St	Phila., Pa.
3 BOV	Snowden J. Strobel, 3923 N. 6th St	Phila., Pa.
3 BOW	John DeFonso, 2530 S. Jessup St	Phila., Pa.
3 BOX	Horace P. Deacon, Jr., 5904 Wayne Ave	Phila., Pa.
3 BOY	Ernest S. Frey, 136 Lemon St	Lancaster, Pa.
3 BOZ	Wm. E. Frisbie, QRS. 118 West,	Fortress Monroe, Va.
3 BPA	Stanley Glaser, 2739 Macomb St	Wash., D. C.
3 BPB	Frank W. Unterberger, 13 League St	Phila., Pa.
3 BPC	Henry Kunzmann	Fortress Monroe, Va.
3 BPD	Motor Parts Service, 1425 N. Broad St	Phila., Pa.
3 BPE	Charles O. Wilson, 1640 W St., S.E.,	Wash., D. C.
3 BPF	George M. Phillips, 413 E. Capitol St	Wash, D. C.
3 BPG	C. W. Pfeifer, 434 N. Patterson Park Av.,	Baltimore, Md.
3 BPH	Russel W. Finger, 448 Royden St	Camden, N. J.
3 BPI	George R. Barker, 536 6th St., S.E.	Wash., D. C.
3 BPJ	Edward F. Samaha, 8 Eldgridge Pl.	Atlantic City, N. J.
3 BPK	Frans C. Nagel, 357 N St., S.W.	Wash., D.C.
3 BPL	Harry W. Brown, 122 Nassau St	Princeton, N. J.
3 BPM	Ralph R. Garrick, 126 N. Redfield St	Phila., Pa.
3 BPN	Howard Steinour, 1425 Gorsuch Ave	Baltimore, Md.
3 BPO	Zeno R. Wright, 610 6th St., N.E.	Wash., D. C.
3 BPP	Deford C. Mills, 812 Whittier Pl.	Wash., D. C.
3 BPQ	Edward B. Sandrus, 314 Main St	Parkesburg, Pa.
3 BPR	Vincent E. Powers, 1715 Guilford Ave	Baltimore, Md.
3 BPS	George L. Wilcox, 23 N. Walnut St	Nanticoke, Pa.
3 BPT	Allan Smith, 1524 Fairmount Ave	Phila., Pa.
3 BPU	Joseph G. Drolet, 5201 Woodland Ave	Phila., Pa.
3 BPV	Edward M. Reilly, 2835 N. 25th St	Phila., Pa.
3 BPW	Bertrand D. Oldham, 1524 Fairmount Ave	Phila., Pa.
3 BPX	Ladow Hammell, Illinois St	Absecon, N. J.
3 BPY	Alfred G. Windston, 135 Powelton Ave	Woodlynne, N. J.
3 BPZ	J. Wilbur Boorse, 219 E. Third St	Lansdale, Pa.

Fourth District

4 AA	W. M. Nelson	Kernersville, N. C.
4 AB	W. A. French, Jr., 107 S. 4th St	Wilmington, N. C.
4 AC	Lee Smith, 229 Main St	Reidsville, N. C.
4 AD	R. A. Saeger	Ankona, Fla.
4 AE	W. Y. Andrews	Indiana Springs, Jackson, Ga.
4 AF	Hi Grade Wireless Instrument Co., 47-49 Zillicoa St.,	Asheville, N. C.
4 AG	W. B. Pope, 197 Dearing St	Athens, Ga.
4 AH	H. Broden, 1304 Myrtle Ave	Jacksonville, Fla.
4 AI	H. E. Bussey, 49 W. 12th St	Atlanta, Ga.
4 AJ	R. F. Morse, 525 E. 2nd St	Jacksonville, Fla.
4 AK	A. B. Whittaker, Jr., 221 E. 10th St	Atlanta, Ga.
4 AL	C. W. Clodfelter, 42 South Pleasant St.,	Winston-Salem, N. C.
4 AM	J. C. Davis, 76 Metcalf St	New Bern, N. C.
4 AN	S. L. Rogers, W. Jefferson St	Boston, Ga.
4 AO	E. L. Rice, 1702 E. Duval St	Jacksonville, Fla.
4 AP	W. E. Dobbins, Jr., 1020 E. North Ave	Atlanta, Ga.
4 AQ	P. S. Foster, 16 Oak Park Rd	Asheville, N. C.
4 AR	T. P. Mathewson, 310 Main St	Reidsville, N. C.
4 AS	E.K.Cargill, Lamont St., Log Cabin Heights,	Macon, Ga.
4 AT	J. L. Crusoe, 1025 Eaton St	Key West, Fla.
4 AU	Wm. A. Ward, Jr., 87 Forrest Ave	Atlanta, Ga.
4 AV	C. B. Thompson, 109 26th St	Columbus, Ga.
4 AW	R. M. Robbins, 410 N. Oliver St	West Palm Beach, Fla.
4 AX	R. B. Flowers, 302 Spring St	Atlanta, Ga.
4 AY	L. Rucker, 45 W. 11th St	Atlanta, Ga.
4 AZ	P. C. Bangs, 29 Albemarle Ave	Atlanta, Ga.
4 BA	C. W. Corless, Jr., 202 Ridley Ave	Lagrange, Ga.
4 BB	E. H. Diemmer, 1805 Jenkins St	Augusta, Ga.
4 BC	B. Ohlhaber, Oliver St	West Palm Beach, Fla.
4 BD	E. S. Bullock, 307 N. 4th St	Wilmington, N. C.
4 BE	C. A. Roethlinger, 214 Campbell St	Wilmington, N. C.
4 BF	L. W. McClung, 1601 Bonnivista	St. Petersburg, Fla.
4 BG	E. Mau, 51 Elizabeth St	Atlanta, Ga.
4 BH	H. Martin, 915 7th St	Miami, Fla.
4 BI	W. Brown, 214 7th St	Miami, Fla.
4 BJ	G. R. Terry, 1912 Barnard St	Savannah, Ga.
4 BK	G. Pierce Rankin, 155 Boulevard Ave	Macon, Ga.
4 BL	J. C. Cooper, Jr., Ortega Blvd.	Ortega, Fla.
4 BM	D. E. Day, 228 Spring St	Winston-Salem, N. C.
4 BN	F. W. York, Clover St	Winston-Salem, N. C.
4 BO	M. Fernandes, P. O. Box No. 201	Key West, Fla.
4 BP	M. D. Clark, 1924 Swift St	Jacksonville, Fla.
4 BQ	G. L. Hight, 200 E. 9th St	Rome, Ga.
4 BR	S. Mishler	Biscayne, Fla.
4 BS	W. E. Wood, 1711 1st Ave. N. E.	Miami, Fla.
4 BT	D. Hightower, 267 Marietta St	Atlanta, Ga.
4 BU	G. B. King, 101 Post St	Jacksonville, Fla.
4 BV	J. P. Pretlow, 321 S. 3rd St	Wilmington, N. C.
4 BW	Wm. M. Sampler, 209 Beech Ave	Macon, Ga.
4 BX	G. S. Smith, 107 N. 6th St	Wilmington, N. C.
2 BY	J. E. Hodge, 911 Abercorn	Savannah, Ga.
4 BZ	B. W. Benning, 50 Whiteford Ave	Atlanta, Ga.
4 CA	G. D. Humphrey, 402 N. 4th St	Wilmington, N. C.
4 CB	J. E. Walker, Jacksonville & Florida Aves.,	Tampa, Fla.
4 CC	J. T. Morehead, 215 Eugene St	Greensboro, N. C.
4 CD	C. L. Pierce, 221 W. Peachtree St	Atlanta, Ga.
4 CE	F. L. Bunker, 505 Crescent Ave	Charlotte, N. C.
4 CF	I. R. Guthrie, 45 E. 18th St	Jacksonville, Fla.
4 CG	LeRoy Edwards, 32 Prospect Pl	Atlanta, Ga.
4 CH	J. C. Kellow, Route C	Spring Glen, Fla.
4 CI	Holt Electric Utilities Co., 10 W. Bay St.,	Jacksonville, Fla.
4 CJ	D. W. Moore, 242 25th St. N. E.	Miami, Fla.
4 CK	Wm. E. Lineback, Jr., 843 Piedmont Ave.,	Winston-Salem, N. C.
4 CL	W. C. Roberts, 15 Oak St	Commerce, Ga.
4 CM	W. G. Depew, R. F. D.	Sewalls Point, Fla.
4 CN	W. B. Short, 78 W. North Ave	Atlanta, Ga.
4 CO	R. M. Cleveland, 118 Adair St	Decatur, Ga.
4 CP	P. C. Herault, care of Georgia Railway & Power Co.,	Atlanta, Ga.
4 CQ	E. J. Gluck, 1418 E 7th St	Charlotte, N. C.
4 CR	W. McL. Davis, 1016 Market St	Wilmington, N. C.
4 CS	L. V. Davis, 16th & Lake Blvd.	St. Petersburg, Fla.
4 CT	M. H. Gaston, 307 Covington St	Jackson, Ga.
4 CU	A. J. Copeland, 3rd St	Jackson, Ga.
4 CV	J. R. Mathewson, 310 Main St	Reidsville, N. C.
4 CW	C. S. Johnson, Windsor Hotel	Jacksonville, Fla.
4 CX	Roy Linville, 646 13th St	Winston-Salem, N. C.
4 CY	A. L. Freeman	Fort Lauderdale, Fla.
4 CZ	R. W. Boyd, 1003 May St	Jacksonville, Fla.
4 DA	C. D. Short, 233 Washington Ave	Macon, Ga.
4 DB	L. F. Grubbs, 511 M St	West Palm Beach, Fla.
4 DC	F. B. Saunders, 95 Highland View	Atlanta, Ga.
4 DD	J. P. Hook, 84 E. North Ave	Atlanta, Ga.
4 DE	Wm. A. Marsh, Cor. 3rd Av. & 25th St	Miami, Fla.
4 DF	M. L. McClung, 130 E. 2nd St	Jacksonville, Fla.
4 DG	Miss M. T. Lewis	Fort Lauderdale, Fla.
4 DH	J. Banks, Jr., 115 Broad St	Lagrange, Ga.
4 DI	A. Z. Oberdorfer, 122 W. Ashley St	Jacksonville, Fla.
4 DJ	J. M. Freeman, 579 N. Jackson St	Atlanta, Ga.
4 DK	J. Wadsworth, 1460 Evergreen Ave	Jacksonville, Fla.
4 DL	R. C. Bender, 326 Jefferson Rd	West Palm Beach, Fla.
4 DM	J. R. Wilke, 36 Ripley St	Atlanta, Ga.
4 DN	S. Holtsberg, Pine St	Pierce, Fla.
4 DO	H. L. Hamilton, 584 S. Blvd.	Atlanta, Ga.
4 DP	C. J. Napier, 202 Southwest 10th Ave	Miami, Fla.
4 DQ	H. P. Woodward, 616 Davie Ave	Statesville, N. C.
4 DR	R. R. Parkhill, S. King St	Jacksonville, Fla.
4 DS	F. A. Chapman	Ward, S. C.
4 DT	C. and E. H. White, 510 Park Ave	Legrange, Ga.
4 DU	C. L. Mitchell, Jr., P. O. Box 724	Fort Lauderdale, Fla.
4 DV	J. M. Baird, Eberhardt Ave	Columbus, Ga.
4 DW	A. C. Robinson, 1503 W. University Ave.,	Gainesville, Fla.
4 DX	F. Dodd, Jr., 1103 Vernon St	Lagrange, Ga.
4 DY	H. H. Pike, 206 Park Ave	Lagrange, Ga.
4 DZ	L. S. Bookwalter, N. Poinsettia St,	West Palm Beach, Fla.
4 EA	A. W. Parker, 15 Change St	New Bern, N. C.
4 EB	B. W. Cochran	Palmetto, Ga.
4 EC	C. Schuster, 204 N. 3rd St	Wilmington, N. C.
4 ED	S. L. Boyett, 214 Verne St	Tampa, Fla.
4 EE	A. J. Cook, Box 272 Flat Shoals Rd	Atlanta, Ga.
4 EF	G. E. Pigford, 513 Chestnut St	Wilmington, N. C.
4 EG	W. C. Etheredge, 36 E. George St	Woodruff, S. C.
4 EH	H. A. Cole, 335 Hill St	Atlanta, Ga.
4 EI	G. G. Trammell, 25 Milledge Ave	Atlanta, Ga.
4 EJ	F. A. Sommers, 421 1st St	Miami, Fla.
4 EK	T. Hatcher, 142 Adams St	Decatur, Ga.
4 EL	L. J. Hahne, 8 West 43rd St	Savannah, Ga.
4 EM	R. L. McCall, 99 E. Merritts Ave	Atlanta, Ga.
4 EN	T. M. Simpson, 411 Cherry St	Winston-Salem, N. C.
4 EO	C. E. Kelly, 303 N. Moreland St	Atlanta, Ga.
4 EP	J. W. Geeslin, 245 N. Moreland Ave	Atlanta, Ga.
4 EQ	B. W. Winterkorn, 277 Glenwood Ave	Atlanta, Ga.
4 ER	C. L. Craig, 141 Glenwood Ave	Atlanta, Ga.
4 ES	A. O. Bliss, Jr., 127 10th St	Miami, Fla.
4 ET	T. C. Green, 929 Sumter St	Columbia, S. C.
4 EU	E. Fox, 13 Travis Ave	Charlotte, N. C.
4 EV	P. C. Herault, 955 N Boulevard St	Atlanta, Ga.
4 EW	A. Davis, 1506 Dock St	Wilmington, N. C.
4 EX	H. M. Cates, 1517 7th St	Miami, Fla.
4 EY	W. J. Overman, 509 N. Road St	Elizabeth City, N. C.
4 EZ	C. F. Clark, 19 Reynolds St	Jacksonville, Fla.
4 FA	O. F. Miller, The Waverly	Columbus, Ga.
4 FB	A. Bush, 480 Meigs St	Athens, Ga.
4 FC	H. W. McCutcheon, 465 Crew St	Atlanta, Ga.
4 FD	E. H. Brack	Midville, Ga.
4 FE	R. Clarke, 102 E. Burgess St	Elizabeth, N. C.
4 FF	Savannah Radio School, 204 West Broughton St.,	Savannah, Ga.
4 FG	M. G. Nicholson, Jr., 298 Hull St	Athens, Ga.
4 FH	R. F. Kimball, Sleepy Eye Lodge	Vero, Fla.
4 FI	H. C. Wheat, 104 Grenard St	Gaffney, S. C.
4 FJ	J. C. Candler, East Lake Drive	Atlanta, Ga
4 FK	F. K. Shaw, 524 White St	Atlanta, Ga.
4 FL	J. Persons	Talbotton, Ga.
4 FM	H. H. Snyder, 211 Central Ave	Atlanta, Ga.
4 FN	A. Rumble, 234 Oak Haven Ave	Macon, Ga.
4 FO	G. R. Smathers, 329 E. Liberty St	Charlotte, N. C.
4 FP	J.N.Plaster, 512 N. Highland Ave	Winston-Salem, N. C.
4 FQ	R. E. Green, 707 S. Boulevard St	Atlanta, Ga.
4 FR	C. J. Davies, 805 Lafayette St	Tampa, Fla.
4 FS	F.W.Wienbarg, Jr., 819 W. State St	Jacksonville, Fla.
4 FT	G. A. Iler, 615 Ponce de Leon St	Atlanta, Ga.
4 FU	K. L. Peacock, 41 7th St. S.E	Miami, Fla.
4 FV	C. Master, Jr., 182 South Ave	Atlanta, Fla.
4 FW	Dona Brown	Talbotton, Ga.
4 FX	H. E. Gaffnet, Victoria Ave	Gaffney, S. C.
4 FY	C. W. McKee	Conway, Ga.
4 FZ	J. A. Sellas, 206 E. St	Tampa, Fla.
4 GA	D. Musten, P. O. Box 102	Kernersville, N. C.
4 GB	W. T. Rich, 116 Peachtree Circle	Atlanta, Ga.
4 GC	R. B. Hall, 139 Myrtle St	Atlanta, Ga.
4 GD	P. H. Briggs, 633 Duncan Ave	Macon, Ga.
4 GE	R. R. Brewin, 106 Jones St. W	Savannah, Ga.
4 GF	A. R. Foy, 5 40th St. E	Savannah, Ga.
4 GG	H. E. Cobble, 197 W. Kimball St	Atlanta, Ga.
4 GH	W. J. & E. A. Jackson, 17 Monroe Pl	Asheville, N. C.
4 GI	W. F. Williams, 204 Plum St	Atlanta, Ga.
4 GJ	E. A. Dupree, R.F.D. No. 2	Raleigh, N. C.
4 GK	A. J. Harriss, 309 Wrightsville Ave	Wilmington, N. C.
4 GL	F. A. Hill, 1223 E. Duffy St	Savannah, Ga.
4 GM	A. L. Reese, 21 W. 14th St	Atlanta, Ga.
4 GN	J. B. Jones	Midville, Ga.
4 GO	S. O. Ross, 51 W. 2nd St	Jacksonville, Fla.
4 GP	Wm. S. Weathespoon, 8 Hawkins Ave	Sanford, N. C.
4 GQ	F. E. Johnston, 124 E. Hall St	Savannah, Ga.
4 GR	H. Bennett, 1717 Oak St	Jacksonville, Fla.
4 GS	M. B. Smith, 502 W. Davis St	Burlington, N. C.
4 GT	F. J. Guiffrida, Jr., 447 Washington St	Atlanta, Ga.
4 GU	K. J. Cranford, 716 Main St	Macon, Ga.
4 GV	H. L. Penn, 454 New St	Macon, Ga.
4 GW	N. W. Peck, 813 King St	Jacksonville, Fla.
4 GX	R. O. Hollard, P. O. Box 283	Sanford, N. C.
4 GY	R. Isley, 808 W. Davis St	Burlington, N. C.
4 GZ	R. M. Barnes, 256 Lee St	Atlanta, Ga.
4 HA	T. A. White, 415 Wrightsville Ave	Wilmington, N. C.
4 HB	F. G. Wickersham, 534 Main St	College Park, Ga.
4 HC	T. LaHatti, 614 Capitol Ave	Atlanta, Ga.
4 HD	G. H. Klinck, 1 Trapman Ave	Charleston, S. C.
4 HE	J. J. Fogarty, 707 Azeele St	Tampa, Fla.
4 HF	G. J. Pfeiffer, 702 5th St	Augusta, Ga.
4 HG	H. B. Fuller, 110 Moore St	Bennettsville, S. C.
4 HH	C. L. Moore, 1901 Taliaferro St	Tampa, Fla.
4 HI	T. D. Bayley, 117 Forrest St	Decatur, Ga.
4 HJ	E. Smith, 315 St. Johns Ave	South Jacksonville, Fla.
4 HK	J. Womack, 161 Main St	Reidsville, N. C.
4 HL	J. C. Waller, 27 Vinzant St	Jacksonville, Fla.
4 HM	M. S. Alexander, 55 Kalb Ave	Atlanta, Ga.
4 HN	T. W. Deloach, 513 Indian St	Savannah, Ga.
4 HO	W. E. Merck, West 3rd St	Jackson, Ga.
4 HP	A. H. Stewart, Jr., 204 Buford Pl	Macon, Ga.
4 HQ	F. W. Taylor, 222 W. DeSoto St	Pensacola, Fla.
4 HR	G. Wrigley, 311 E. Park Ave	Greenville, S. C.
4 HS	V. B. Bayliss, 337 Juniper St	Atlanta, Ga.
4 HT	G. V. Harvey, 1064 Walnut St	Macon, Ga.
4 HU	J. P. Smith, Ocean Blvd	West Palm Beach, Fla.
4 HV	H. E. Kennedy, Hillston Rd	West Raleigh, N. C.
4 HW	L. Wade, Jr., 114 Millrose Ave	Decatur, Ga.
4 HX	T. L. Brandon, 134 Venable St	Atlanta, Ga.
4 HY	Hi Grade Wireless Instrument Co., 47-49 Zillicoa St.,	Asheville, N. C.
4 HZ	G. Grange, Route 1, Box 103	S. Jacksonville, Fla.
4 IA	J. H. Hunter, 247 Juniper St	Atlanta, Ga.
4 IB	Federal Board School, U. S. P. H. S. H. No. 26,	Greenville, N. C.
4 IC	E. C. Cormack, 1320 N. W. 8th Court	Miami, Fla.
4 ID	J. H. Robertson, 600 W. Council St	Salisbury,
4 IE	French Broad Camp	Brevard, N. C.
4 IF	L. Todd, 525 Oklahoma Ave	Ocala, Fla.
4 IG	S. Dane	Homestead, Fla.
4 IH	F. V. Long	Boca Ratone, Fla.
4 II	M. F. Harrod, 1204 E. Washington St	Orlando, Fla.
4 IJ	H. T. Schliestett, Box No. 8, R.F.D. No. 1,	Cedartown, Ga.
4 IK	H. B. Ward, 606 Palmetto St	S. Jacksonville, Fla

4 IL	Jose Sanchez, 221 Simonton St	Key West, Fla.
4 IM	E. L. Bailey, 55 Poplar Circle	Atlanta, Ga.
4 IN	L. L. Hardon, Jr., 2801 Millwood Ave	Columbia, S. C.
4 IO	E. Rumble, 234 Oak Haven Ave	Macon, Ga.
4 IP	B. E. Moore, Jr., 54 Graven St	New Bern, N. C.
4 IQ	E. R. Curry, 1309 Petronia St	Key West, Fla.
4 IR	W. C. Lane, Jr., 28 Hawkins Ave	Sanford, N. C.
4 IS	J. D. Blitch, 331 N. Main St	Statesboro, Ga.
4 IT	J. A. Braddy, 210 Franklin St	Dublin, Ga.
4 IU	P. H. Carr, 824 Union St.	Gaffney, S. C.
4 IV	F. D. Pilgrim, 73 Bradford St	Gainesville, Ga.
4 IW	L. V. Davis, 16th & Lake Blvd.	St. Petersburg, Fla.
4 IX	F. B. Duncan	Tonares, Fla.
4 IY	R. H. McMillan, 115 E. 3rd St	Atlanta, Ga.
4 IZ	W. Moore, 339 Plant Ave	Tampa, Fla.
4 JA	G. & D. Perrine, 152 Jefferson Pl	Decatur, Ga.
4 JB	I. P. Lasater	Jonesboro, N. C.
4 JC	R. P. Hutchinson, 308 S. Lewis St	Lagrange, Ga.
4 JD	E. Powell, 206 S. Lewis St	Lagrange, Ga.
4 JE	J. Agusty, 3 San Joseph St	San Juan, Porto Rico
4 JF	W. Woodruff, 242 Ponce de Leon St	Decatur, Ga.
4 JG	J. J. Cushman, 1502 Miami Pl. N. E.	Miami, Fla.
4 JH	M. Solomon, 300 College St	Macon, Ga.
4 JI	T. Litschauer	Winter Park, Fla.
4 JJ	W. T. Booth, 272 Lee St	Atlanta, Ga.
4 JK	C. Wells, 1309 Buncombe St	Greenville, S. C.
4 JL	C. N. Hughs, 90 Lawton St	Atlanta, Ga.
4 JM	R. C. Carpenter, 49 LaFrance St	Atlanta, Ga.
4 JN	J. D. Smith, 92 Park Ave	Atlanta, Ga.
4 JO	B. L. Torrey, 452 S. McIntosh St	Elberton, Ga.
4 JP	W. F. Franklin, 1101 Selma Ave	Tampa, Fla.
4 JQ	R. E. Grunert, 612 S. Poplar St.	Winston-Salem, N. C.
4 JR	J. W. Perry, 868 E. North Ave	Atlanta, Ga.
4 JS	E. Rogers, 242 Ponce de Leon St	Decatur, Ga.
4 JT	H. D. Hendrick	Township No. 44 Range, Alva, Fla.
4 JU	L. Greeson, 107 Moody Ave	Tampa, Fla.
4 JV	A. P. Graham, 34 Putavo St	San Juan, Porto Rico
4 JW	S. H. Lamb, 311 Pearl St	Elizabeth City, N. C.
4 JX	D. B. Blair, 30 Grady Pl	Atlanta, Ga.
4 JY	E. R. Hall, 2801 Central Ave	St. Petersburg, Fla.
4 JZ	A. B. Meyer, 510 S. Second Ave.	St. Petersburg, Fla.
4 KA	W. J. Pooser, 525 Beech St	Atlanta, Ga.
4 KB	J. H. Raffo, 108 Third St	Tampa, Fla.
4 KC	T. Freck, 47 Baird St	Asheville, N. C.
4 KD	L. I. Mims, 105 Brookline St	Atlanta, Ga.
4 KE	T. T. Earle, 311 Hampton Ave	Greenville, S. C.
4 KF	C. G. McElroy, 617 Willow St	Tampa, Fla.
4 KG	J. J. Pearson, 34 Josephine St	Atlanta, Ga.
4 KH	J. R. Shaw, 524 White St	Atlanta, Ga.
4 KI	H. L. Eskew, 401 Lloyds St	Greenville, S. C.
4 KJ	E. G. Code, 167 Ashley Ave	Charleston, S. C.
4 KK	P. K. Kendrick, Camp Jessup	Atlanta, Ga.
4 KL	J. C. Fleming, 106 Powell St	Atlanta, Ga.
4 KM	L. K. Rush, 22 Cherry St	Atlanta, Ga.
4 KN	H. Wendt, Route 1, Box 135A	S. Jacksonville, Fla.
4 KO	F. H. Klauman, 713 S. Palmetto Ave.,	St. Petersburg, Fla.
4 KP	J. O. St. John, 146 Greenville St	Newman, Ga.
4 KQ	Hi Grade Wireless Institute Co., 47-49 Zillicoa St.,	Asheville, N. C.
4 KR	Hi Grade Wireless Institute Co., 47-49 Zillicoa St.,	Asheville, N. C.
4 KS	J. M. M. Ramos, 37 Allen St	San Juan, Porto Rico
4 KT	J. T. Pinero, Ignacio Arsuqga	Carolina, Port Rico
4 KU	H. L. Reid, 69 E. Park Lane	Atlanta, Ga.
4 KV	A. Hall, 116 McAfee St	Atlanta, Ga.
4 KW	F. A. Saxon, 227 Greene St	Augusta, Ga.
4 KX	G. G. Reynolds, Country Club Rd,	Winston-Salem, N. C.
4 KY	W. J. Pinkstone, 500 N. Troupe St	Valdosta, Ga.
4 KZ	W. E. Fennell, Twickenham Terrace	Savannah, Ga.

Fifth District

5 QS	J. D. Cameron	Dublin, Texas
5 QT	Orren Walden, Grafton St	Dublin, Texas
5 QU	John Grady Owen, 2609 Clarence St	Dallas, Texas
5 QV	Chester A. Curry, 1410 N. Broad St	New Orleans, La.
5 QW	J.E.W. Gilenwaters, 1371 N. Bway St.,	Knoxville, Tenn.
5 QX	M. K. & A. H. Steddon, 1504 W. 9th St.,	Oklahoma City, Okla.
5 QY	Will Eugene Gray, 2510 Rio Grande St	Austin, Texas
5 QZ	J. W. Lowry, Jr., 18th St. & 33rd Ave.,	Meridian, Miss.
5 RA	Raymond A. Fulk, 113 W. Broadway St	Cuero, Texas
5 RB	Frederick Cooper, 3918 Rawlins St	Dallas, Texas
5 RC	J. P. Buchanan, Jr., 412 Sycamore St.,	Brenham, Texas
5 RD	Phil Wittman, 708 Augusta St	Mobile, Ala.
5 RE	S. E. Adcock, 2000 Washington Ave.,	Knoxville, Tenn.
5 RF	Richard A. Stevens, 2815 Peters Ave	New Orleans, La.
5 RG	Newell Ramsey, 836 5th St	Port Arthur, Texas
5 RH	Roy L. Alciatore, 1908 Peniston St	New Orleans, La.
5 RI	Roy M. Latham	Elm Mott, Texas
5 RJ	Robert B. Greene, 1108 Hobson St	Sapulpa, Okla.
5 RK	J. A. Massey	Cedar Bayou, Texas
5 RL	Stephen R. Phelan, 533 Beale St	Memphis, Tenn.
5 RM	R. L. Harris, 2105 Fairmount Ave.,	Fort Worth, Texas
5 RN	Dixon B. Penick, 2404 University Ave	Austin, Texas
5 RO	Knox E. Clapp, 2322 Wolfe St	Little Rock, Ark.
5 RP	John R. Alexander	Clairette, Texas
5 RQ	Emanuel V. Wolff, 1360 Carr Ave	Memphis, Tenn.
5 RR	Paul N. Jett, 207 Mason St	San Antonio, Texas
5 RS	Franklin K. Matejka, 102 W. 20th St	Austin, Texas
5 RT	Irving M. Laybourne, 1408 Congress Ave	Austin, Texas
5 RU	Ben E. Gordon, 717 Beale St	Memphis, Tenn.
5 RV	Leroy Rush, 1220 19th Ave	Meridian, Miss.
5 RW	L. H. Vaughan	Comanche, Texas
5 RX	Carl F. Moltzen	Baileyville, Okla.
5 RY	Rudolf Hertzberg, 3129 DeSoto St	New Orleans, La.
5 RZ	Oscar S. Rodgers, 1275 Thomas St	Memphis, Tenn.
5 SA	Ermin J. Teykl, 301 N. 1st St	Elgin, Texas
5 SB	Conrad F. Harington, 212 E. 20th St	Little Rock, Ark.
5 SC	Boy Scouts of America	Crosby, Texas
5 SD	Robert S. Crandall, 2314 22nd St	Meridian, Miss.
5 SE	Julian Laine, 1130 Mandeville St	New Orleans, La.
5 SF	Houston Hendrix, 1616 Worth St	Fort Worth, Texas
5 SG	Raymond U. McKinney, 803 S. Boulder St	Tulsa, Okla.
5 SH	R. A. Morrow, 915 S. E. 3rd St	Mineral Wells, Texas
5 SI	E. Ray Arledge	Ryan, Ark.
5 SJ	Vaughn W. Davis, 901 S. E. 3rd St.,	Mineral Wells, Texas
5 SK	M. R. Sanguinet, Jr., 130 Belle Pl	Fort Worth, Texas
5 SL	Walter Sherry, 60 N. Catherine St	Mobile, Ala.
5 SM	Dr. L. M. Hunter, 2420 Izard St	Little Rock, Ark.
5 SN	A. B. Lewis, University Campus	University P.O., Miss.
5 SO	Paul C. Barnes, 300 West St	Arlington, Texas
5 SP	Wm. L. High	England, Ark.
5 SQ	Rees L. Beddon, 3925 Fort Blvd	El Paso, Texas
5 SR	H. H. Friend, 1 block east Wash. St.	Sand Springs, Okla.
5 SS	Jim Sweeny	Pearsall, Texas
5 ST	Joe H. Hunter, R.F.D. No. 4	Chico, Texas
5 SU	Edw. H. Cathriner, Barrett St	Humble, Texas
5 SV	Theo. H. Stoner, Okmulgee High School	Okmu'gee, Okla.
5 SW	Robert L. Bailey, 1705 Wyoming St	El Paso, Texas
5 SX	Lawrence J. Smyth, 210 Holcombe St	Montgomery, Ala.
5 SY	L. Chapman, 4119 Classen Blvd.	Oklahoma City, Okla.
5 SZ	H. E. Wehrman, 4003 Carondelet St	New Orleans, La.
5 TA	Peter T. Crosby, 329 East D. St	Oklahoma City, Okla.
5 TB	Ethridge E. Pitts, 3538 Avenue K.	Polytechnic, Texas
5 TC	W. L. Allison, Jr., P. O. Box 1557	Fort Worth, Texas
5 TD	Chas. H. Thornton, 825 College St	Shreveport, La.
5 TE	Geo. W. Curry, 113 Duke St	Yoakum, Texas
5 TF	Carl C. Clayton, 1012 Spruce St	Texarkana, Texas
5 TG	Jas. W. Hunt, 403 Goodwin St	Victoria, Texas
5 TH	A. L. Overstreet, 42 So. Main St	Paris, Texas
5 TI	Samuel Brendle	Arlington, Texas
5 TJ	Francis M. Floyd, 516 White St	Norman, Okla.
5 TK	Graham Kendall, 3614 Hall St	Dallas, Texas
5 TL	George M. Howard, 1615 Arizona St	El Paso, Texas
5 TM	Roy L. Lay, 110 Hubbard St	Yoakum, Texas
5 TN	Jessie R. Collins, 216 Cooper St	Arlington, Texas
5 TO	Rawleigh H. Ralls, 629 Edwards St	Edmond, Okla.
5 TP	Ancell Lee Foster, Box 283	Forney, Texas
5 TQ	Richard R. Beavens, 2404 Speedway	Austin, Texas
5 TR	H. W. Rogers, 1100 Seventh St	East Los Vegas, N. M.
5 TS	Fred R. Groch, 1901 Happer St	El Paso, Texas
5 TT	Robert M. Warriner, 3202 Avenue Q	Galveston, Texas
5 TU	Homer C. Carr	Commerce, Texas
5 TV	Oscar A. Rasmussen	Marianna, Texas
5 TW	Marion B. Tomme, 1505 Avenue D	Brownwood, Texas
5 TX	Maury H. McRae	Corinth, Miss.
5 TY	Houston Radio Cl., 3800 Harrisburg Blvd	Houston, Texas
5 TZ	John Jackson, 105 Dittmar St	San Antonio, Texas
5 UA	Jos. Howard Pummill, 5904 Belmont St	Dallas, Texas
5 UB	R. B. Greene, 475 Elm St	Norman, Okla.
5 UC	Don R. Wells	Morrilton, Ark.
5 UD	Paul A. Bryan, 805 N. Rockell Ave	Terrell, Texas
5 UE	Ben H. Woodruff, Tyler St	Conway, Ark.
5 UF	John S. Roberts, Jr., 1806 Farragut St	Laredo, Texas
5 UG	Troy Baxter	Dublin, Texas
5 UH	Frank D. Sutton, 604 Main St	Sparta, Tenn.
5 UI	Duncan Merriwether, 1 Elliot St	Montgomery, Ala.
5 UJ	W. A. & J. S. Swearinger	Lockhart, Texas
5 UK	Chas. A. Freitag, 8520 Forshey St	New Orleans, La.
5 UL	Clarence D. Beeth	Tucumcari, N. M.
5 UM	D. J. Canale, 549 Belvidere Blvd	Memphis, Tenn.
5 UN	Ralph Parker, 1639 Collins Ave	Wichita Falls, Texas
5 UO	James R. Martin, 1517 12th St	Wichita Falls, Texas
5 UP	Grady C. Coleman	Irondale, Ala.
5 UQ	Bryan Evans, 324 West French St	San Antonio, Texas
5 UR	James Sides, 310 Asylum St	Terrell, Texas
5 US	John F. Roach, Washington St	Corinth, Miss.
5 UT	Eugene Knoblock, Jr., 627 Canal St	Thibodaux, La.
5 UU	S. W. Wilkinson, 313 Commerce Ave	Knoxville, Texas
5 UV	Glendale Wirt, 817 Canal St	Thibodaux, La.
5 UW	Willard Stewart	Brownwood, Texas
5 UX	Clyde A. Abernathy	Quinlan, Texas
5 UY	E. B. Frysinger, 619 N. Anglin St	Cleburne, Texas
5 UZ	Donald Percy	Thibodaux, La.
5 VA	T. Frank Smith, Jr., 311 E. Rush St	Mexia, Texas
5 VB	Jack C. Perry, 1142 N. 3rd St	Abilene, Texas
5 VC	G. Henry Jones	Gadsen, Ala.
5 VD	Ralph Vermillion, 4629 Rusk Ave	Houston, Texas
5 VE	Wm. L. Kincaid, 1635 N. 4th St	Abilene, Texas
5 VF	Maurice W. Hardy, 4226 Roseland Ave	Dallas, Texas
5 VG	Allen H. Henderson	Alamogordo, N. M.
5 VH	Chas. H. Fletcher, 1500 High Ct	Little Rock, Ark.
5 VI	G. A. DeCortin, 139 N. Alexander St	New Orleans, La.
5 VJ	Fitzhugh Smith, 327 Sayre St	Montgomery, Ala.
5 VK	Robert A. Glover, 1425 Brady Ave	Brownwood, Texas
5 VL	James V. Fitzhugh, 802 Erie St	San Antonio, Texas
5 VM	Wm. Green, 807 Lahoma Ave	Norman, Okla.
5 VN	A. G. Elliot, III., 4324 Highland Dr	Dallas, Texas
5 VO	Wilbur M. Jackson, 436 Breeden St	San Antonio, Texas
5 VP	John McArthur	Moss Point, Miss.
5 VQ	G.D.Rayburn, Box 444, R.F.D. No.2,	San Antonio, Texas
5 VR	Wm. E. Branch, 2609 Clarence St	Dallas, Texas
5 VS	Richard D. Mason, 1005 A St	Lawton, Okla.
5 VT	Frank Billin, 602 St. Phillip St	Thibodaux, La.
5 VU	Jack Bond, 405 Johnson St	Terrell, Texas
5 VV	S. Kenneth Sawyer, 1714 Leighton St	Anniston, Ala.
5 VW	Burres O'Neill	Thibodaux, La
5 VX	W. M. Bruce, Jr., Morrilton Cot. Oil Co.	Morrilton, Ark.
5 VY	H. C. Sherrod, 1627 Ave. I	Galveston, Texas
5 VZ	Milton Peveler, N. Travis St	Granbury, Texas
5 WA	Orin P. McCarty, 506 E. Park Ave	San Antonio, Texas
5 WB	Julien L. McGuire, 1629 Quintard Ave	Anniston, Ala.
5 WC	Lawrence P. Stark, 1504 Alfred St	Brownwood, Texas
5 WD	Lloyd W. Vickery, 304 W. Lincoln St	Blackwell, Okla.
5 WE	Russell T. Cole, 506 Caldwell St	Conway, Ark.
5 WF	Ralph M. Pemberton, Box 24, R.F.D. No. 1	Scott, Ark.
5 WG	Wm. E. Owen, 1924 Albert St	Alexandria, La.
5 WH	Kenneth B. Griffin, 418 W. Park St	Enid, Okla.
5 WI	Lee Johnson, 1312 Bishop St	Little Rock, Ark.
5 WJ	Jas. A. Bowling, 434 Calhoun St	New Orleans, La.
5 WK	Thomas E. Story, 222 N. Moose St	Morrilton, Ark.
5 WL	Earl C. Johnson, 724 7th St	Memphis, Tenn.
5 WM	Cecil J. Scott, 301 Park Ave	Little Rock, Ark.
5 WN	Chas. J. Testa	Krebs, Okla.
5 WO	Chas. M. Cowan, 1691 Dandridge Pike	Knoxville, Tenn.
5 WP	Edward E. McCall, 1306 Woodstock Ave	Anniston, Ala.
5 WQ	Wallace E. Harris	Conroe, Texas
5 WR	Brownwood High School	Brownwood, Texas
5 WS	Sam. W. Wilkinson, Kingston Pike	Knoxville, Tenn.
5 WT	Logan Cox	Ferris, Texas
5 WU	John E. Hoff	Comanche, Texas
5 WV	Clarence D. Carter, City Hall	Childress, Texas
5 WW	Guy Simmons, Jr., 515 Clifton St	Conway, Ark.
5 WX	John B. Lewis, 520 S. Cincinnati St	Tulsa, Okla.
5 WY	Paul McCoy Wright, 1012 James St	Enid, Okla.
5 WZ	V. W. Bouldin, 702 S.W. 4th Ave	Mineral Wells, Texas
5 AAA	Cecil Adair, 3515 Swiss Ave	Dallas, Texas
5 AAB	Sidney R. LaNier, 1210 Gallatin Blvd	Nashville, Tenn.
5 AAC	Wm. C. Smith, 227 N. Locust St	Fayetteville, Ark.
5 AAD	Chillicothe High School	Chillicothe, Texas
5 AAE	Lamar Lunt, 1415 Ellis Ave	Fort Worth, Texas
5 AAF	Cypert D. McCary	Frost, Texas
5 AAG	Clinton H. Marsh, 700 Poplar St	Chattanooga, Tenn.
5 AAH	Wm. Perry Cecil, 606 E. St	Ardmere, Okla.
5 AAI	Seth B. Ford, Jr., R.F.D. No. 2	Rockdale, Texas
5 AAJ	Chas. N. Tinsley, 1520 25th Ave	Meridian, Miss.
5 AAK	Ira A. Kirksey, 1420 Ave. A	Brownwood, Texas
5 AAL	H. F. Williams, 912 39th Ave	Meridian, Miss.
5 AAM	J. B. Lowenstein, 1204 16th Ave. S	Nashville, Tenn.
5 AAN	Kenneth A. Snarr, 123 N. Logan St	Charleston, Ark.
5 AAO	Rawleigh H. Ralls, 39½ E. Main St	Edmond, Okla.
5 AAP	Will C. Barbe, 122 W. 7th St	Oklahoma City, Okla.

Sixth District

6 AUR	W. A. Carlson, 1710 34th Ave	Oakland, Cal.
6 AUS	E. E. Vetter, 912 Persia Ave	San Francisco, Cal.
6 AUT	R. E. Esparza, 1915 Lincoln Ave	Alemeda, Cal.
6 AUU	H. A. Tattenbam, 316 Richland Ave	Alemeda, Cal.
6 AUV	E. J. Cole, 116 Florida St	Vallejo, Cal.
6 AUW	R.E.Ghidella, 2051 Leavenworth St.,	San Francisco, Cal.
6 AUX	R. H. Hanlon, 437 Walnut St	San Francisco, Cal.
6 AUY	R. Moore, 2612 Buena Vista Ave	Alemeda, Cal.
6 AUZ	E. M. Hall, 931 61st St	Oakland, Cal.
6 AVA	G. Deauner, 154 J St	Tulare, Cal.
6 AVB	C. A. Pearson, 2323 F St	Sacramento, Cal.
6 AVC	J. B. Boyd, 12th & Market Sts	Oakland, Cal.
6 AVD	J. R. Alsip, R.F.D. No. 3, Box 735	Watts, Cal.
6 AVE	J. C. Graner, 1121 Santa Clara St	Vallejo, Cal.
6 AVF	J. H. Hadly, 1190 Jackson St	San Francisco, Cal.
6 AVG	R. Winenow, 269 Richland Ave	San Francisco, Cal.
6 AVH	R. Richardson, 4258 Foothill Blvd	Oakland, Cal.
6 AVI	L. C. Cole, 733 E. 3rd St	Los Angeles, Cal.
6 AVJ	M. S. Wood, 483 L St	Dinnba, Cal.
6 AVK	H. V. Rugh, Jr., 2425 Alhambra Ave	Alhambra, Cal.
6 AVL	F. L. Walker, Jr.	Westwood Lassen County, Cal.
6 AVM	R. Zimmerman, 2318 K St	Sacramento, Cal.
6 AVN	J. Shaw, 150 W. Third St	Claremont, Cal.
6 AVO	B. McMahon	Compton, Cal.
6 AVP	E. E. Barnett, 548 W. 6th St	Long Beach, Cal.
6 AVQ	H. Knaugh, 250 3rd St	San Francisco, Cal.
6 AVR	C. Yates, R.F.D. No. 3, Box 104A	Fullerton, Cal.
6 AVS	H. Norik, 506 Orange Ave	Long Beach, Cal.
6 AVT	H. Frame, 2533 Brant St	San Diego, Cal.
6 AVU	K. Lampkin, 114 Bonito Court	Ontario, Cal.
6 AVV	M. P. Ports, 3265 Belmont	Fresno, Cal.
6 AVW	R. Garcia, 1003 N. Coronado St	Los Angeles, Cal.
6 AVX	G. G. Monck, 2330 3rd St	San Diego, Cal.
6 AVY	L. P. Simpson, 1040 W. 51st Pl	Los Angeles, Cal.
6 AVZ	W. G. Edwards, 2221 Hunt St	Monterery Park, Cal.
6 AWA	P. H. Adams, 756 E Ave	Coronado, Cal.
6 AWB	J. H. Smith, 320 Nielford St	Glendale, Cal.
6 AWC	G. C. Callender, 139 Jessie St	Manteca, Cal.
6 AWD	E. Owens, 2302 Garfield St	Monterey Park, Cal.
6 AWE	H. C. Rider, 933 N. Haward Blvd	Los Angeles, Cal.
6 AWF	A. Chamberlain, 106 W. 3rd St	Los Angeles, Cal.
6 AWG	R. Squire, 39 Granada St	San Francisco, Cal.
6 AWH	E. G. Seely, 540 S. 9th St	Salt Lake City, Utah
6 AWI	U. S. Beadley, 1917 Raymond Ave	Los Angeles, Cal.
6 AWJ	S.W.Lohman, 4408 Santa Monica Blvd,	Los Angeles, Cal.
6 AWK	B. Fredenthal, 527 Euclid Ave	Ontario, Cal.
6 AWL	W. Weltman, 2124 6th Ave	Los Angeles, Cal.
6 AWM	F. W. Wood, 1418 Walvern Ave	Los Angeles, Cal.
6 AWN	A. E. Moorhead, Jr., 284 Perkins St	Oakland, Cal.
6 AWO	W. Phillips, 905 York St	Vallejo, Cal.
6 AWP	E. W. Thatcher, 407 W. 1st St	Santa Ann, Cal.
6 AWQ	San Diego High School	San Diego, Cal.
6 AWR	D. G. Hewitt, Box 596	Stanford University, Cal.
6 AWS	H. D. Schmidt, 383 Ocean Ave	Santa Cruz, Cal.
6 AWT	B. Moliniari, 653 Union St	San Francisco, Cal.
6 AWU	W. Stonerook, 3702 Utah St	San Diego, Cal.
6 AWV	C. H. Weatherhill, 1509 G St	Reedly, Cal.
6 AWW	L. Jones	Manteca, Cal.
6 AWX	E. Sedlacek, Jr., 267 W. Badello St	Covnia, Cal.
6 AWY	L. P. Bennett, 428 B St	Hayward, Cal.
6 AWZ	G. E. Gray, 432 Linden Ave	Long Beach, Cal.
6 BAA	Geo. W. Wamer, Jr., 5526 Telegraph Ave	Oakland, Cal.
6 BAB	R. Lewis, 31 Monte Ave	Piedmont, Cal.
6 BAC	E. Miller, 1645 American Ave	Long Beach, Cal.
6 BAD	G. R. Martin, 423 N. Curtis St	Alhambra, Cal.
6 BAE	G. S. Morris, 5132 Lincoln Ave	Los Angeles, Cal.
6 BAF	G. L. Povell, 375 Molino Ave	Long Beach, Cal.
6 BAG	E. L. Ramer, 2220 86th Ave	Oakland, Cal.
6 BAH	P. W. Pierce, 1916 Villa Ave	Pasadena, Cal.
6 BAI	G. H. Dennis, Box 596	Stanford University, Cal.
6 BAJ	H. M. Hines, 1045 N. Stevenson Ave	Pasadena, Cal.
6 BAK	R. Bunch, 610 Pacific Ave	Santa Cruz, Cal.
6 BAL	T. Howell, 1777 Crystal Ave	Salt Lake City, Utah
6 BAM	F. L. Walker, Jr.	Westwood, Cal.
6 BAN	L. Vesper, 2035 Alemeda Ave	Alemeda, Cal.
6 BAO	James Kennedy, Jr., 266 Carl St	San Francisco, Cal.
6 BAP	W. F. Frederick, Jr., 670 Walsworth St	Oakland, Cal.
6 BAQ	C. W. Smith, 142 Shrader St	San Francisco, Cal

6 BAR C. Anderson, 3732 Seneca Ave.......Los Angeles, Cal.
6 BAS W. L. Burnett, 2904 Harper St........Berkeley, Cal.
6 BAT Salesian Club, 666 Filbert St......San Francisco, Cal.
6 BAU C. H. Rockwell, R.R. No. 1, Box 110....Anaheim, Cal.
6 BAV H. M. Huges, 1631 Dale St..........San Diego, Cal.
6 BAW M. Alberton, 852 Westchester Pl.....Los Angeles, Cal.
6 BAX F. R. Welch ....Hanford, Cal.
6 BAY F. Grant, 234 Union St............Watsonville, Cal.
6 BAZ Mrs. M. O. Houston, 3420 Union St....San Diego, Cal.

6 BBA H. D. Graves, 1454 S. Broadway..........Chico, Cal.
6 BBB (This call has not been assigned.)
6 BBC P. Borden ....Brea, Cal.
6 BBD C. L. Worthly, 1118 A. Berendo St....Los Angeles, Cal.
6 BBE C. K. Burns, 1835 Bancroft St.......San Diego, Cal.
6 BBF T. H. Howells, L. D. S. University, Salt Lake City, Utah
6 BBG J. R. Harding, Harlman Bay..Enterprise, Butte, Cal.
6 BBH E. A. Neilson, 115 S. 21st Ave........Phoenix, Cal.
6 BBI A. H. Schmith, Main St......Battle Mountain, Nev.
6 BBJ A. F. Miller, 1328 18th St.......Santa Monica, Cal.
6 BBK J. Gilleran, Jr., 222 W. San Carlos St...Los Angeles, Cal.
6 BBL B. A. Nisja, 479 34th Ave........San Francisco, Cal.
6 BBM M. A. Hawkins, 2850 19th Ave.....San Francisco, Cal.
6 BBN K. Dilks, 1326 W. 16th St.........Los Angeles, Cal.
6 BBO H. B. Chambers, 780 Rialto Ave.......Pasadena, Cal.
6 BBP G. C. Hooton, R.F.D. No. 1..........Los Gatos, Cal.
6 BBQ Maelk, 194 S. El Molino Ave.........Pasadena, Cal.
6 BBR W. E. Carman, 165 Linton Way ....Auburn, Cal.
6 BBS L. L. Upde Graff, 1450 San Pasqual St..Pasadena, Cal.
6 BBT K. Walton, 418 Second Ave......San Bernardino, Cal.
6 BBU E. Knor, 134 E. Central St............Covine, Cal.
6 BBV F. Pollard, 200 W. Badello St..........Covena, Cal.
6 BBW W. C. Nielhaus, 429 S. Painter............Cove, Cal.
6 BBX C. Stewart, Fifth St................San Rafael, Cal.
6 BBY A. Penrose, 210 University Av........Los Gatos, Cal.
6 BBZ F. Anderson, Jr., 466 Campus Ave..San Bernardino, Cal.

6 BCA G. Wilson, 363 S. 11th St............San Jose, Cal.
6 BCB R. H. Speck ....Upland, Cal.
6 BCC S. M. Roycroft, 114 N. Isabel St........Glendale, Cal.
6 BCD S. H. Simpson, Box 130 ....Salida, Cal.
6 BCE V. M. Alsworth, 174 N. 1st St..........Provo, Utah
6 BCF John Fishbeck, 20 N. Greenwood St.....Pasadena, Cal.
6 BCG Wm. A. Bryan, First Ave.................Upland, Cal.
6 BCH W. Rosenthal, 176 15th Ave........San Francisco, Cal.
6 BCI D. Skilling, 2960 Linden Ave..........Berkeley, Cal.
6 BCJ E. Salmine ....St. Helena, Cal.
6 BCK A. J. Nachbaur ....Vallejo, Cal.
6 BCL C. Bluffum, 116 20th St.............Monterey, Cal.
6 BCM S. R. Harris, Carolina St..............Vallejo, Cal.
6 BCN H. Hutchinson, 121 W. Center St........Covina, Cal.
6 BCO L. S. Green ....Gridly, Cal.
6 BCP E. Atmore, R.F.D. Box 38..........Santa Monica, Cal.
6 BCQ E. R. Huge, Mt. Wilson Observatory....Mt. Wilson, Cal.
6 BCR C. Foreman, 1714 Alemeda Ave........Alemeda, Cal.
6 BCS J. Windly, Market St...................Moneta, Cal.
6 BCT A. J. Linoer, 1330 E. Pierce St........Phoenix, Cal.
6 BCU H. Bidwell ....San Marcos, Cal.
6 BCV W. J. Robinson, 2318 Santa Clara St....Alemeda, Cal.
6 BCW F. L. Ramer, 231 Magnolia St..........Modesto, Cal.
6 BCX S. Schlenther, 2915 Magnelia St.........Oakland, Cal.
6 BCY D. Dart, 1315 Tamalpias Rd..........Berkeley, Cal.
6 BCZ H. Hadly, 74 Henry St...........San Francisco, Cal.

6 BDA H. Frank, 1465 McAllister St.......San Francisco, Cal.
6 BDB O. Stone, 1831 Balboa St..........San Francisco, Cal.
6 BDC W. W. Schmidt, 605 19th Ave....San Francisco, Cal.
6 BDD S. Slassen ....Bolinas, Cal.
6 BDE W. A. Huber, 1603 San Bruno Ave..San Francisco, Cal.
6 BDF E. Hendrickson, 2036 7th Ave..........Oakland, Cal.
6 BDG W. F. Betts, 1533 19th St.......Santa Monica, Cal.
6 BDH I. W. Eisenberg, 105 N. 4th St.......Alhambra, Cal.
6 BDI I. Wright, Box 125, R.F.D............Glendora, Cal.
6 BDJ A. Clapper, 141 E. Center St............Covine, Cal.
6 BDK C. Gutte, 1034 Goshen Ave............Visalia, Cal.
6 BDL W. D. Cheney, 2723 Benovenue Ave.....Berkeley, Cal.
6 BDM J. R. Evans ....Riverbank, Cal.
6 BDN G. S. Clark, P. O. Box 383............Bishop, Cal.
6 BDO M. C. Starky ....Taft, Cal.
6 BDP H. M. Williamson, 674 Sixth St........Hollister, Cal.
6 BDQ T. L. Mayes ....Colinga, Cal.
6 BDR W. H. Baird ....Fellows, Cal.
6 BDS L. J. Wren, 911 13th St............Modesto, Cal.
6 BDT W. S. Shin, 1941 Funchale Lane......Honolulu, T. H.
6 BDU Pacific Radio School, R. Tinker, 75 New Montgomery St.,
San Francisco, Cal.
6 BDV B. F. Zenser, Jr., 810 W. 48th St....Los Angeles, Cal.
6 BDW D. C. Halsey, 232 W. Grove St.......Hollywood, Cal.
6 BDX J. De Laney, 367 E. 57th St.......Los Angeles, Cal.
6 BDY H. Ramer, 4547 Cleveland Ave........San Diego, Cal.
6 BDZ A. E. Barnes, 1901 Okley St......South Pasadena, Cal.

6 BEA W. L. Evans, 241 N. Hallenback St...Los Angeles, Cal.
6 BAB R. A. Reed, 1800 3rd St...........San Diego, Cal.
6 BEC C. R. Noren, 6016 York Blvd........Los Angeles, Cal.
6 BED C. H. Smith, 126 Anza St..........San Francisco, Cal.
6 BEE C. J. Hansen, 3454 Percy St.........Los Angeles, Cal.
6 BEF G. D. Hicks, 3327 Jefferson Ave......San Diego, Cal.
6 BEG J. P. Weather, 1221 Trenton St......Los Angeles, Cal.
6 BEH B. C. Edwards, 515 Sinclair St.............Reno, Nev.
6 BEI C. D. Thomas, 2801 La Salle Ave......Los Angeles, Cal.
6 BEJ F. McCullough, 3161 College Ave........Berkeley, Cal.
6 BEK H. R. Green, 1814 S. Vernon St.....Los Angeles, Cal.
6 BEL J. P. Blindboy, 618 Bushnell St.......Alhambra, Cal.
6 BEM K. Kavaelie, R.F.D. No. 1, Box 463B....Gardena, Cal.
6 BEN E. Bradford, Lost Hills.............Kern County, Cal.
6 BEO C. D. Thomas, 2801 La Salle St......Los Angeles, Cal.
6 BEP R. Julian, 1260 E. 4th St..........Long Beach, Cal.
6 BEQ G.H.Rubener, 410 W. Santa Baraba Ave, Los Angeles, Cal.
6 BER J. Newman, 4130 Bachman Pl........San Diego, Cal.
6 BES W. A. Starzinger, 2050 E. Tyanta St......Watts, Cal.
6 BET M. Albertson, Jr., 852 Westchester St..Los Angeles, Cal.
6 BEU G. M. Stockton, P. O. Box 155........Le Grand, Cal.
6 BEV J. Valle, 2430 8th St.................Berkeley, Cal.
6 BEW J. Vandermark, Jr., 2240 23rd Ave.......Oakland, Cal.
6 BEX R. J. Hittle, 2637 Orange Ave..........Oakland, Cal.
6 BEY E. Rea, 1383 5th Ave............San Francisco, Cal.
6 BEZ W. A. Wagener, 407 Hillside Court....Piedmont, Cal.

6 BFA T. J. Murphy, 1926 Rosedale Ave.......Oakland, Cal.
6 BFB W. A. Willis, 6003 Ocean View Ave.....Oakland, Cal.
6 BFC M. Cook, 563 Oakland Ave............Oakland, Cal.
6 BFD G. J. Ryneaison, 627 West. 4th St....Long Beach, Cal.
6 BFE K. Lampkin, 114 Bonita Court..........Ontario, Cal.
6 BFF E. Michelson, 132 Olive Ave..........Piedmont, Cal.
6 BFG Calvin M. Fitch, 735 N. Gibb St.......Pomona, Cal.
6 BFH W. W. Phillips, 1102 California Ave....Glendale, Cal.
6 BFI B. Piersall, General Delivery ....Hemet, Cal.
6 BFJ G. Hickman, 1004 S. Euclid St.........Ontario, Cal.
6 BFK A. Austin, 2944 Avalon Ave...........Berkeley, Cal.
6 BFL P. W. Dann, 562 35th St.............Oakland, Cal.
6 BFM M. W. Boyer, 155 Arlington St....San Francisco, Cal.
6 BFN R. Rhodes, 42 Broderick St........San Francisco, Cal.
6 BFO L. A. Manual Arts High School, 1113 W. Vernon Ave.,
Los Angeles, Cal.
6 BFP T. W. Falck, 1228 W. 2nd St.......Los Angeles, Cal.
6 BFQ C. Harritt, 1715 Firm St...........San Diego, Cal.
6 BFR C. O. Gould, 615 E. Main St.........Stockton, Cal.
6 BFS W. E. Granger, R-3 Box 214........Long Beach, Cal.
6 BFT E. McLean, 4512 Oregon St..........San Diego, Cal.
6 BFU J. H. Badsly, 1965 Marin Ave.........Berkeley, Cal.
6 BFV G. E. Miller, 1432 32nd St...........Oakland, Cal.
6 BFW C.M.Bishop, General Delivery, Big Creek, Orange Co., Cal.
6 BFX T. L. Dowling, 1520 E. 17th St........Oakland, Cal.
6 BFY J. R. Peterson, 187 Cresent Ave....San Francisco, Cal.
6 BFZ E. A. Folstad, 4466 45th St.........San Diego, Cal.

6 BGA Dinuba Marion High School, Box 442......Dinuba, Cal.
6 BGB J. N. Taylor, 4016 Foothill Blvd.......Oakland, Cal.
6 BGC M. E. Kennedy, 415 W. Lexington St...Glendale, Cal.
6 BGD A. Towle, 2731 Webster St...........Berkeley, Cal.
6 BGE R. R. Seaville, No. 2 Claremont Apts. 27, Adams,
Ogden, Utah
6 BGF B. Baker, Box 742 ....Dinuba, Cal.
6 BGG E. A. Ames, R.F.D. No. 1, Box 86A..Fullerton, Cal.
6 BGH K. Coble ....Highland, Cal.
6 BGI R. D. Kukland, 918 Sonoma St..........Vallejo, Cal.
6 BGJ E. Diwry, 445 W. Lexington Dr........Glendale, Cal.
6 BGK F. Micklejohn, Main St...........Baldwin Park, Cal.
6 BGL C. C. Bunds ....San Rafael, Cal.
6 BGM W. Sutliff, 460 Baker St..........San Francisco, Cal.
6 BGN A. R. Lusey, 1268 Clayton St......San Francisco, Cal.
6 BGO W. G. Closson, 947 Jones St........San Francisco, Cal.
6 BGP A. Eliner Nichelson, 132 Olive St........Piedmont, Cal.
6 BGQ L. R. Girerd, 236 Broad St.......San Francisco, Cal.
6 BGR G. Malone, 128 Palm Ave...........San Rafael, Cal.
6 BGS B. L. Haskell, 2141 24th Ave..........Oakland, Cal.
6 BGT G. F. Rosemont, 21 Rosemont Pl....San Francisco, Cal.
6 BGU J. J. Blanchet, 4106 Brookdale Ave.....Oakland, Cal.
6 BGV H. Benioff, 1295 E. Villa St..........Pasadena, Cal.
6 BGW E. Biro, 1536 37th Ave..............Alemeda, Cal.
6 BGX P. H. Cawthron, 908 Clinton St........Oakland, Cal.
6 BGY L. Crary, 1519 Arc Way ....Burlingame, Cal.
6 BGZ E. T. DeLisle, 153 Roberts Ave.......San Rafael, Cal.

6 BHA W. M. Hatch, Jr., 1331 Foothill Blvd...Pasadena, Cal.
6 BHB K. A. Goode, 1122 Division St.........Pasadena, Cal.
6 BHC E. Gilroy, Box 473 ....Bay Point, Cal.
6 BHD Miss U. E. Le Fevre, 24 Penna Ave....Los Angeles, Cal.
6 BHE V. H. Keishner, 417 63rd St..........Oakland, Cal.
6 BHF H. Johnson, Box 534 ....Coalinga, Cal.
6 BHG C. Kerr, 39 W. 2nd St..................Provo, Utah
6 BHH E. F. Tunnerman, General Delivery...Garden Grove, Cal.
6 BHI H. Zahl, P. O. 183 ....Porterville, Cal.
6 BHJ F. Tremagne, Jr., Box 24 ....Ceres, Cal.
6 BHK H. W. Waggoner ....Fair Oaks, Cal.
6 BHL C. C. Vieira, Box 156...............Atwater, Cal.
6 BHM O. D. Seely ....Mt. Pleasanton, Cal.
6 BHN B. A. Ontiveros, 215 E. Main St....Santa Maria, Cal.
6 BHO J. Klingelhofer, R.F.D. No. 3...........Atwater, Cal.
6 BHP P. R. Cunningham ....Colfax, Cal.
6 BHQ M. Ellison, 2108 23rd Ave...........Oakland, Cal.
6 BHR Sunset Radio Eng. Co., 601 54th St.....Oakland, Cal.
6 BHS R. Brown, 15721 Normandy Ave.........Gardena, Cal.
6 BHT F. Hageman, 1710 4th St..........Los Angeles, Cal.
6 BHU Van Allen Trout, 175 San Carlos Ave..Sausalito, Cal.
6 BHV W. T. Morton ....Yosemite, Cal.
6 BHW R. M. Schino, 3927 Angdo Ave..........Oakland, Cal.
6 BHX H. L. Prindle, 1350 Keweah St.........Hanford, Cal.
6 BHY Garfield Jr. High School, 16th & 23rd Ave, Oakland, Cal.
6 BHZ Earl R. Meisner, 2329 Carlton St.......Berkeley, Cal.

6 BIA M. Z. Johnson, Route 3, Box 74B.....Sebastopol, Cal.
6 BIB K. E. Taylor, 230 Hudson Ave.........Pasadena, Cal.
6 BIC W. S. Martin, Lawley's Road..........Calistoga, Cal.
6 BID G. W. Fairbanks, 1467 W. 23rd St......Gardena, Cal.
6 BIE C. J. Carr, Box 106 ....Le Grande, Merced County, Cal.
6 BIF E. L. Menlove, 255 S. 2nd St............Provo, Utah
6 BIG C. F. Walsh, 529 Mission St........San Rafael, Cal.
6 BIH M. J. Fickas, 236 20th St..............Merced, Cal.
6 BII F. Bayer, 157 S. Gramercy Pl........Los Angeles, Cal.
6 BIJ H. M. Houston, 433 Hagar St......San Fernando, Cal.
6 BIK Northern Orange Co. Radio Association...Fullerton, Cal.
6 BIL E. J. Baughman ....Taft, Cal.
6 BIM R. A. Fry, 120 Jefferson St.........Watsonville, Cal.
6 BIN E. L. Nance, Lincoln Ave.............Callistoga, Cal.
6 BIO C. H. Hubbard, 1109 Colledge Ave........Oakland, Cal.
6 BIP G.A.Becker, Jr., 231 West Sheppard St...Winnemucca, Nev.
6 BIQ C. H. McCoy ....Livermore, Cal.
6 BIR J. E. Brandlin, 206 S. Prom St............Napa, Cal.
6 BIS K. Kerr, 1528 Ramona Ave..........So. Pasadena, Cal.
6 BIT E. H. Mayo ....Bard, Cal.
6 BIU L. R. Mock, 332 11th St..............San Jose, Cal.
6 BIV A. E. West, Chestnut St...........Redwood City, Cal.
6 BIW E. A. Gibson, Main St...............Los Gatos, Cal.
6 BIX A. W. Prather, 4611 43rd St........San Diego, Cal.
6 BIY E. J. Rush, 4118 Adams Ave.........San Diego, Cal.
6 BIZ M. B. Flood ....Del Mar, Cal.

6 BJA H. O. Sutton, 1147 Westmoreland Ave..Los Angeles, Cal.
6 BJB R. L. Littligow, 2325 Lime Ave.......Long Beach, Cal.
6 BJC L. Levi, 540 St. Andrews Pl.........Los Angeles, Cal.
6 BJD A. G. Moore, 2114 La Loma Dr....Hermosa Beach, Cal.
6 BJE M. Clapp, 300 Elevado Dr..............Pasadena, Cal.
6 BJF C.D.Meyerhauer, 315 S. Orange Grove St., Pasadena, Cal.
6 BJG N. Cave, 1347 Myrtle Ave.........Long Beach, Cal.
6 BJH J. Buel, 80 Sierra Bonita St..........Pasadena, Cal.
6 BJI L. Fromm, 379 Marenyo St..........Los Angeles, Cal.
6 BJJ A. F. Ewald, 2820 Manitou Ave.......Los Angeles, Cal.
6 BPK H. Wood, 1819 S. Burlingame Ave....Los Angeles, Cal.
6 BJL G. A. Chester, 4289 Euclid Ave.......San Diego, Cal.
6 BJM A. Kempbert, 6140 Mesa Ave.........Los Angeles, Cal.
6 BJN G. M. Ludwig, 535 W. Ortega St....Santa Barbara, Cal.
6 BJO E. L. Harris, 1323 S. Hill St........Los Angeles, Cal.
6 BJP C. G. Eckart, Hitchcock Neil Academy..San Rafael, Cal.
6 BJQ L. C. Haynes, 1216 N. Maclay St......Los Angeles, Cal.
6 BJR E. J. Howes, 337 Mathews St.........Los Angeles, Cal.
6 BJS G. Z. Johnson, 4267 Ampuda St.......San Diego, Cal.
6 BJT H.Cunningham,Jr., 1115 Fairview Ave..S. Pasadena, Cal.
6 BJU R. Rober, 2146 Loga Ave............San Diego, Cal.
6 BJV G. C. Bennington, P. O. Box 395 .....Coronado, Cal.
6 BJW R. Kettenerhofen, 1216 Trenton St....Los Angeles, Cal.
6 BJX E. Sitar, 133 Milton Ave............Hollywood, Cal.
6 BJY A. Simmons, 205 21st St............San Diego, Cal.
6 BJZ G. Krotser, 877 Sonoma Ave..........Santa Rosa, Cal.

6 BKA O. Wright, 784 S. El Molino Ave......Pasadena, Cal.
6 BKB C. A. Taylor, 332 Hager St........San Fernando, Cal.
6 BKC A. Strong, 2460 A St...............San Diego, Cal.
6 BKD S. Sinart, 15th & Olive Sts.........Pas Robles, Cal.
6 BKE E. Seegwiller ....Redfields, Utah
6 BKF R. Crippen, 1136 E. A St............Ontario, Cal.
6 BKG W. H. Earle, 3060 California St....San Francisco, Cal.
6 BKH Dr. R. O. Shelton, 3443 Fifth St.....San Diego, Cal.
6 BKI J. H. Brown, 725 E. Hill St.........Los Angeles, Cal.
6 BKJ Lee Adams, 217 S. Daly St.........Los Angeles, Cal.
6 BKK J. Barth, 1040 20th St.............San Diego, Cal.
6 BKL R. Bell, 2138 Stockton Dr...........San Diego, Cal.
6 BKM R. H. Tuber, 659 Del Mar Ave....Chuela Vista, Cal.
6 BKN R. Limert, 1003 L St..............Bakerfield, Cal.
6 BKO W. Kirkpatrick, 2284 W. 8th St......Los Angeles, Cal.
6 BKP S. T. Arnold, Anzerias Ave...........San Jose, Cal.
6 BKQ P. K. Churchill, 1031 W. 31st St....Los Angeles, Cal.
6 BKR L. Wilson, 1457 81st Ave ....Oakland, Cal.
6 BKS W. L. Logan, 474 W. Hollister Ave...Los Angeles, Cal.
6 BKT A. Tawller, Jr., 4226 Hobart St......Los Angeles, Cal.
6 BKU W. Finlay, 1633 E. 4th St..........Santa Ana, Cal.
6 BKV J. Jaquer, Jr., R.F.D. No. 1, Box 168-B....Napa, Cal.
6 BKW M. Chambers, 921 Powell St...........Hollister, Cal.
6 BKX E. L. Gray ....San Jacinto, Cal.
6 BKY G. V. Hallock, 224 W. Florida St........Hamet, Cal.
6 BKZ N. Otis, 222 Chud St..................Nowalk, Cal.

6 BLA F. Liefort, 1402 20th St............Bakerfield, Cal.
6 BLB C. Green, Route D, Box 317............Modesto, Cal.
6 BLC P. Haridenson ....La Canada, Cal.
6 BLD C. Turney, 135 Sudden St..........Watsonville, Cal.
6 BLE C. P. Otler, 419 Clinton Ave..........Roseville, Cal.
6 BLF W. Galonska, 126 Spruce St........Redwood City, Cal.
6 BLG C. Scullin, 702 Rushnell Ave..........Alhambra, Cal.
6 BLH E. E. Lovejoy, 320 S. 4th East St, Salt Lake City, Utah
6 BLI P. W. Plune............................Quincy, Cal.
6 BLJ P. Davidson, 665 S. 6th St.......Salt Lake City, Utah
6 BLK C. W. Dickson, 908 D St........San Bernadino, Cal.
6 BLL J. Fallon, 303 E. Medieltorence St..Santa Barbara, Cal.
6 BLM J. Caniff ....Sebastopole, Cal.
6 BLN J. Narcearato, P. O. Box 1123 ....Morenci, Ariz.
6 BLO J. E. Stowe, P. O. Box 364...........Capitola, Cal.
6 BLP A. Cadwell, 9th & California..........Beaumont, Cal.
6 BLQ L. Armsbee, 15813 Normandie Ave......Gardena, Cal.
6 BLR F. Wilson, 525 Meda Ave.............Glendera, Cal.
6 BLS R. Ransay, 19 Michigan Blvd. East.....Pasadena, Cal.
6 BLT G. P. Bell, 5th St.................San Rafael, Cal.
6 BLU R. Johnson, 463 W. Myrtle St..........Glendale, Cal.
6 BLV R. E. Sawyer, 2036 La France Ave....S. Pasadena, Cal.
6 BLW C. Blood, P. O. Box 73..............Rio Vista, Cal.
6 BLX M.F.Kuyomura, R.F.D. No. 2, Box 252..Torrance, Cal.
6 BLY J. J. Farrell, Jr., 373 Fair Oaks St..San Francisco, Cal.
6 BLZ O. Wood, 717 Acequia St...............Visalia, Cal.

6 BMA H. T. Kirk, 402 First Nat. Bank Bldg..Bakerfield, Cal.
6 BMB E. S. McDonald ....Sonoma, Cal.
6 BMC E. T. Treen, 1308 Wilkshire Blvd....San Monica, Cal.
6 BMD K. K. Kidd, 311 2nd St..................Taft, Cal.
6 BME C. H. Hoff, 16 Vernon St........San Francisco, Cal.
6 BMF W. G. Smith, 918 E. 6th St..........Tucson, Ariz.
6 BMG T. Phillips Elec. Shop, 1920 E. Front St..Salma, Cal.
6 BMH J. E. Courtsley, 232 E. Spenser St.....Modesto, Cal.
6 BMI U. Smith ....Rio Vista, Cal.
6 BMJ H. Searing, 300 N. Alto St.........Los Angeles, Cal.
6 BMK L. F. Proft ....Williamson, Ariz.
6 BML C. E. Gilden, Jr. ....Sisson, Cal.
6 BMM (Unassigned)
6 BMN (Unassigned)
6 BMO (Unassigned)
6 BMP (Unassigned)
6 BMQ (Unassigned)
6 BMR V. B. Barnes ....Williams, Cal.
6 BMS G. W. Burkhardt ....Montecello, Cal.
6 BMT S. G. Abell, 16 Magnolia St..........San Jose, Cal.
6 BMU C. A. Pindle, 406 W. Oak St..............Lodi, Cal.
6 BMV L. Baridou, 332 Grant St.............Mayfield, Cal.
6 BMW R. H. Deaver, R.F.D. No. 2.............Puente, Cal.
6 BMX R. M. Moore, 902 N. 4th Ave ....Tucson, Ariz.
6 BMY R. S. Tilton, 1700 T St...........Sacramento, Cal.
6 BMZ G. Fontaine ....San Rafael, Cal.

6 BNA H. E. Huntermann ....Ripon, Cal.
6 BNB L. Showalter ....Ripon, Cal.
6 BNC U. S. Palmer ....Willows, Cal.
6 BND R. E. Murry, 620 S. 8th St..........Santa Clara, Cal.
6 BNE H. M. Armstrong, 2462 Potter St..Salt Lake City, Utah
6 BNF J. O. Coffin, 1327 E. South St....Salt Lake City, Utah
6 BNG L. G. Ribon, 189 Main St..........Watsonville, Cal.
6 BNH L.A.High School, 4900 Lowly Club Dr, Los Angeles, Cal.
6 BNI C. D. Chusmann, Jr., 715 Bush St...San Francisco, Cal.
6 BNJ H. Olsen, 566 N. First St...............Provo, Utah
6 BNK R. H. McCollister ....San Rafael, Cal.
6 BNL L. G. Flory, R.F.D. No. 1, Box 93.....Lemoore, Cal.
6 BNM O. Overstrom, 105 S. Pasadena Ave.....Pasadena, Cal.
6 BNN R. B. Lohry, 1921 Irwin Ave..........Oakland, Cal.

Seventh District

7 AA	H. E. Renfro, 7319 48th Ave. S	Seattle, Wash.
7 AB	D. F. Craib, 2146 N. 69th St	Seattle, Wash.
7 AC	H. J. Briscoe	Cascade, Mont.
7 AD	F. J. Brott, Walk 1, No. 10	Seattle, Wash.
7 AE	E. H. Forsman, 2846 W. 73rd St	Seattle, Wash.
7 AF	John W. Huntley, 314 N. Denver St	Spokane, Wash.
7 AG	H. M. Truesdell, 2770 E. 53rd St	Seattle, Wash.
7 AH	Clarence Benzon, 3637 14th Ave. W	Seattle, Wash.
7 AI	T. E. McMahon, 6409 S. Huston St	Tacoma, Wash.
7 AJ	F. B. Mossman, 3015 N. 26th St	Tacoma, Wash.
7 AK	J. E. Belling, 3232 13th Ave. W	Seattle, Wash.
7 AL	W. F.' Whitney, 204 S. 3rd Ave	Bozeman, Mont.
7 AM	E. A. Harrington, 2848 66th St	Seattle, Wash.
7 AN	C. E. Williams, 8326 13th Ave. N. W	Seattle, Wash.
7 AO	L. G. Haw, 14th St. & Bayview	Seattle, Wash.
7 AP	T. T. Smith, 1306 E. 75th St	Seattle, Wash.
7 AQ	P. B. Maginnis, 364 S. 5th St	Marshfield, Ore.
7 AR	D. W. Matthews, 3214 2nd Ave. N	Billings, Mont.
7 AS	Fred Eastman, 1506 28th Ave. W	Seattle, Wash.
7 AT	Carl Capehart, 6314 S. Yakima Ave	Tacoma, Wash.
7 AU	J. L. Webster, 3538 Beach Dr	Seattle, Wash.
7 AV	L. F. Mahoney, 461 Schuyler St	Portland, Ore.
7 AW	B. C. Gamer, 3750 N. 30th St	Tacoma, Wash.
7 AX	B. W. R. Hagen, 101 S. 11th St	Yakima, Wash.
7 AY	Jesse F. Ives, 1942 4th Ave. W	Seattle, Wash.
7 AZ	Clifford Huntley, 426 25th St	Vancouver, Wash.
7 BA	M. C. Richard, 3024 S. 9th St	Tacoma, Wash.
7 BB	W. E. Swartout, 533 Marion Ave	Portland, Ore.
7 BC	Neville R. Benoit, 5406 S. L St	Tacoma, Wash.
7 BD	G. E. Hart	Summer, Wash.
7 BE	B. C. Barnes, 336 9th Ave. E	Eugene, Ore.
7 BF	Edward Rebman, 3110 Sunderland St	Seattle, Wash.
7 BG	K. W. Weingarten, 3219 N. 24th St	Tacoma, Wash.
7 BH	Clive Scott, 345 S. 14th St	Salem, Ore.
7 BI	Lester Smith	Tekoa, Wash.
7 BJ	George Sturley, 206 E. 17th St	Vancouver, Wash.
7 BK	Howard F. Mason, 3335 33rd Ave. S	Seattle, Wash.
7 BL	A. C. Dailey	Lake Burien, Wash.
7 BM	J. E. Bower, 702 Harrison Ave	Helena, Mont.
7 BN	Geo. C. Henny, 530 Heights Terr	Portland, Ore.
7 BO	J. E. Stuart, 212 6th St	Livingston, Mont.
7 BP	R. A. Willison, Jr., 765 Melrose Dr	Portland, Ore.
7 BQ	H. V. Morrow	Cascade, Mont.
7 BR	E. N. Swan, 1461 Portsmouth Ave	Portland, Ore.
7 BS	O. J. Humphrey, Jr., 605 Boylston Ave., N.	Seattle, Wash.
7 BT	E. McLeren, 229 N. 16th St	Portland, Ore.
7 BU	Morris Hoag	Sheridan, Wyom.
7 BV	C. F. Kennedy	Kelso, Wash.
7 BW	Carl A. Hoffman, 618 Sunset Ave	Seattle, Wash.
7 BX	J. J. Towey, 5610 20th Ave. N. W	Seattle, Wash.
7 BY	Wilfred K. Bert, 1924 9th Ave. W	Seattle, Wash.
7 BZ	Ernest O. Ribbins, 300 Fir St	Olympia, Wash.
7 CA	B. V. Lasott, 3316 Railroad Ave., N. E	Seattle, Wash.
7 CB	Winifred E. Dow, 2329 S. K St	Tacoma, Wash.
7 CC	F. C. Olney, Front St	Stanwood, Wash.
7 CD	E. C. Waugh	Willowa, Ore.
7 CE	H. G. Beichert, 818 N. L St	Tacoma, Wash.
7 CF	Roy Alexander, 5046 S. K St	Tacoma, Wash.
7 CG	W. H. Miller, 521 11th Ave. S	Nampa, Idaho
7 CH	H. R. Roodhouse, 914 9th Ave	Nampa, Idaho
7 CI	Geo. E. Mers, 606 26th Ave. N	Seattle, Wash.
7 CJ	Herbert Anderson, 1221 35th Ave	Seattle, Wash.
7 CK	H. W. Woodmansee	Mesa, Idaho
7 CL	Wellington McMillan, 157 Harrison St	Seattle, Wash.
7 CM	W. R. Zinn, 4002 39th Ave. S. W	Seattle, Wash.
7 CN	Wayne K. Harris, 543 N. Broadway	Marshfield, Ore.
7 CO	R. B. Struble, E. 11th St	Red Lodge, Mont.
7 CP	E. C. Martin, 2316 N. Broadway	Seattle, Wash.
7 CQ	M. P. Kavanagh, 411 Franklin St	St. Helens, Ore.
7 CR	R. T. Galyean, 460 Miller Ave	Portland, Ore.
7 CS	W. P. Hawley, Jr., 400 E. 22nd St. N	Portland, Ore.
7 CT	Paul Stoffel, Jr	Cashmere, Wash.
7 CU	Clyde Wood, 1801 Railroad Ave	Aberdeen, Wash.
7 CV	C. H. Hobert, 815 Columbia St	Vancouver, Wash.
7 CW	Olfan DeGuire	Silverton, Ore.
7 CX	L. A. Peek, 4916 Wallingford Ave	Seattle, Wash.
7 CY	Ben Crawford, 325 S. J St	Tacoma, Wash.
7 CZ	C. E. Fraer, 88 Park Ave	Marshfield, Ore.
7 DA	P. L. Cloud, 1418 5th St	Aberdeen, Wash.
7 DB	Frank Torey, 1006 L St. S	Tacoma, Wash.
7 DC	J. A. Rutledge, 1210 Highland Dr	Bremerton, Wash.
7 DD	E. C. Davis, 6919 30th Ave. S. E	Portland, Ore.
7 DE	E. M. Thornton, R.F.D. No. 3	Walla Walla, Wash.
7 DF	Archie L. Bolstad, 1832 4th Ave. W	Seattle, Wash.
7 DG	W. H. Campbell, 1209 Franklin St	Boise, Idaho
7 DH	L. G. Van Slyke	Hyattville, Wyo.
7 DI	R. M. Quarles, 811 Rossigne St	Boise, Idaho
7 DJ	L. L. Stanley, 320 State St	Helena, Mont.
7 DK	Harry I. Veen, 816 8th Ave. N	Great Falls, Mont.
7 DL	Clark Moore, 211 14th St	Raymond, Wash.
7 DM	R. C. Boyd, 420 W. Main St	Helena, Mont.
7 DN	Forest Umphenour, 447 14th St	Bellingham, Wash.
7 DO	Rudolph Miklave	Black Diamond, Wash.
7 DP	George W. Cameron, 500 12th St	Portland, Ore.
7 DQ	Donald Gidley, 771 4th St	Marshfield, Ore.
7 DR	H. E. Baker, 153 Harrison St	Seattle, Wash.
7 DS	D. E. Larson, 777 5th St	Astoria, Ore.
7 DT	R. P. E. Mortell, 102 W. Mercer St	Seattle, Wash.
7 DU	W. G. Ludgate, Jr., 977 Multnomah St	Portland, Ore.
7 DV	H. N. Pinkman, 617 28th Ave. N	Seattle, Wash.
7 DW	L. N. Seger, 5635 S. L St	Tacoma, Wash.
7 DX	J. G. Upthegrove, 344 E. 41st St. N	Portland, Ore.
7 DY	J. E. Middleton, 145 N. Normal St	Burley, Idaho
7 DZ	H. C. McCracken, 460 E. 13th St. N	Portland, Ore.
7 EA	N. A. Clodfelter, 1221 Madison St	Portland, Ore.
7 EB	W. D. Simpson, 1543 Court St	Salem, Ore.
7 EC	R. M. Simington, 1247 Tillamook St	Portland, Ore.
7 ED	W. V. Russ, 831 Michigan St	Portland, Ore.
7 EE	R. E. Marshall, 1135½ Albina Ave	Portland, Ore.
7 EF	H. B. Bogue, 115 W. 14th St	The Dalles, Ore.
7 EG	G. R. Stewart, W. 8th St	Ellensburg, Wash.
7 EH	B. R. Jodrell, 418 25th Ave. S	Seattle, Wash.
7 EI	A. L. Fisher, Jr., 2443 N. Yakima Ave.	Tacoma, Wash.
7 EJ	W. E. Gurley, 2332 Monroe St	Corvallis, Ore.
7 EK	Leslie Lunan, 806 S. M St	Tacoma, Wash.
7 EL	G. H. Folsom, 7427 Olympic Court	Seattle, Wash.
7 EM	E. N. Stone, 4215 Aurora Ave	Seattle, Wash.
7 EN	Bernard Altick, 1715 Ravenna Blvd	Seattle, Wash.
7 EO	H. T. Louis	Dayton, Ore.
7 EP	F. C. Driffield	Unga, Alaska
7 EQ	J. S. Ramsey, 215 E. 9th St	Ellensburg, Wash.
7 ER	C.M.Emigh, 1418 Walla Walla Av.	Walla Walla, Wash.
7 ES	Arthur J. Fries, 1010 N. 11th St	Tacoma, Wash.
7 ET	I. N. Robinson, 623 Boylston Ave	Seattle, Wash.
7 EU	Jos. Mazuranich, 211 Joliet St	Helena, Mont.
7 EV	Lester E. O'Brien, 902 S. G St	Tacoma, Wash.
7 EW	W. S. Palmer, 6308 S. Yakima Ave	Tacoma, Wash.
7 EX	E. L. Wharton	Glasgow, Mont.
7 EY	C. N. Ashla, 1650 E. Terrace St	Portland, Ore.
7 EZ	E. W. Morgan, 530 Tenino Ave	Portland, Ore.
7 FA	J. C. Forrest, 438 High St	Hellingham, Wash.
7 FB	E. C. Richie, 631 Main St	Klamath Falls, Ore.
7 FC	L. S. Young, 1055 Hancock St	Portland, Ore.
7 FD	Alvin Moore, 634 E. 65th St. N	Portland, Ore.
7 FE	F. T. Richards, 6323 5th Ave. N. E	Seattle, Wash.
7 FF	G. B. McCullough, 608 S. 2nd St	Tacoma, Wash.
7 FG	Roy Fifield, 278 Baldwin St	Portland, Ore.
7 FH	Vernon J. Bird, 406 W. 12th St	Vancouver, Wash.
7 FI	D. W. Campbell, 204 Spaulding St	Pullman, Wash.
7 FJ	L. A. Byerly, 909 Bryce St	Portland, Ore.
7 FK	T. A. Wetzel, 904 Vancouver St	Portland, Ore.
7 FL	F. F. Gray, 1208 2nd St	Butte, Mont.
7 FM	J. E. McBride, Bella & 25th Sts	Boise, Idaho
7 FN	R. M. McMillan, 3727 Pacific Ave	Tacoma, Wash.
7 FO	Lloyd Wallgren, 2124 Wetmore Ave	Everett, Wash.
7 FP	J. D. Shaver, 939 The Alameda	Portland, Ore.
7 FQ	L. R. Goddard, 527 Water St	Thekoa, Wash.
7 FR	H. L. Jones, 1208 W. 70th St	Seattle, Wash.
7 FS	A. A. Webster, 7 S. Naches Ave	Yakima, Wash.
7 FT	Currie N. Teed	Kuna, Idaho
7 FU	Willis Oldfield, 1221 Colby Ave	Everett, Wash.
7 FV	W. Countryman, 2022 Oakes Ave	Everett, Wash.
7 FW	H. Tenny, 418 Union St	Seattle, Wash.
7 FX	Theo. McKeon, 2920 Rucker St	Everett, Wash.
7 FY	C. A. Harrington, 104 N. 6th St	Boise, Idaho
7 FZ	C. M. Yadon, 1611 Johnson Ave	Klamath Falls, Ore.
7 GA	C. R. Beamer, 343 E. 35th St	Portland, Ore.
7 GB	C. B. Hurley, Jr., 808 N. Yakima Ave	Tacoma, Wash.
7 GC	Victor Aldrich, 337 N. 4th St	Corvallis, Ore.
7 GD	J. M. Pearson, 740 Schuyler St	Portland, Ore.
7 GE	L. C. Maybee, 828 Bridge St	Pasco, Wash.
7 GF	L. S. Dyer, 761 75th St. N	Seattle, Wash.
7 GG	G. D. Crockett, 1420 Hawthorne Ave	Portland, Ore.
7 GH	Gale Mix	Moscow, Idaho
7 GI	E. F. Barber	St. John, Wash.
7 GJ	P. V. Noorlin, 45 69th St. N. E	Portland, Ore.
7 GK	C. H. Linsley, 1249 Centre St	Evanston, Wyo.
7 GL	C. E. Jean, 1103 E. 64th St	Tacoma, Wash.
7 GM	J. B. Hendry, 720 S. Grant St	Tacoma, Wash.
7 GN	C. A. Newton, 3920 N. 26th St	Tacoma, Wash.
7 GO	C. R. Goodwin, 445 N. Commercial St	Salem, Ore.
7 GP	Allan Gunston, 903 6th St	Olympia, Wash.
7 GQ	M. D. Koupal, 610 W. 5th St	Eugene, Ore.
7 GR	C. R. Schrotke	Bothell, Wash.
7 GS	Lyle Evenson, 518 N. 79th St	Seattle, Wash.
7 GT	C. R. Offield, 8415 Dayton St	Seattle, Wash.
7 GU	J. M. Deady, 150 27th Ave	Seattle, Wash.
7 GV	E. D. Pollock, 2707 10th Ave. N	Seattle, Wash.
7 GW	M. E. McCulloh, 814 S. 15th St	Tacoma, Wash.
7 GX	F. L. Patterson, 865 Williams Ave	Portland, Ore.
7 GY	F. O. Selby, 1401 N. 20th St	Boise, Idaho
7 GZ	Leo C. Clark, 1509 24th Ave	Seattle, Wash.
7 HA	H. B. Churchill, 705 Belmont St	Salem, Ore.
7 HB	G. M. Smith	Eatonville, Wash.
7 HC	Clifford Emery, 611 Malden Ave	Seattle, Wash.
7 HD	A. A. Thibodo	Seaside, Ore.
7 HE	D. W. Coffey	Kalama, Wash.
7 HF	H. H. Skipworth, 1151 Charnelton St	Eugene, Ore.
7 HG	H. C. Williams, 402 E. Jefferson St	Boise, Idaho
7 HH	W. S. Tucker, 2832 N. Broadway	Seattle, Wash.
7 HI	W. B. Robinson, 1113 E. I St	Auburn, Wash.
7 HJ	Fred Brown, R. 5 c|o Mrs. R. P. May	Boise, Idaho
7 HK	E. R. Helfort, 3716 Colby Ave	Everett, Wash.
7 HL	M.D.Richardson, 500 N. Williamette St.	St.Helens, Ore.
7 HM	Merwin Elton, 611 5th Ave. N	Great Falls, Mont.
7 HN	Delmer Jeans, 1090 W. 7th St	Eugene, Ore.
7 HO	Carroll Freeland, 1611 Tieton Dr	Yakima, Wash.
7 HP	Thos. E. Widrig, 1132 8th Ave. W	Seattle, Wash.
7 HQ	T. J. Bidner, 2024 6th Ave	Seattle, Wash.
7 HR	A. D. Cole, 430 15th Ave. E	Eugene, Ore.
7 HS	O. C. Kent	Glasgow, Mont.
7 HT	E. H. Weimer	Cohagen, Mont.
7 HU	Sol. Hasbrouck, 224 E. Idaho St	Boise, Idaho
7 HV	James Ray, 1831 24th Ave	Seattle, Wash.
7 HW	V. K. Roberts, Apt. 62, Monticello	Helena, Mont.
7 HX	P. A. Schumacher, Box 116	St. John, Wash.
7 HY	W. T. Vale, 111 Pine St	Klamath Falls, Ore.
7 HZ	P. L. Schreiber	Cohagen, Mont.
7 IA	J. E. Jenkins, R. R. No. 2	Olympia, Wash.
7 IB	J. O. Nordahl, 809 24th Ave. N	Seattle, Wash.
7 IC	Albert Onsum, 806 E. 55th St	Seattle, Wash.
7 ID	Benedict Barr, Mt. Angel	Benedict, Ore.
7 IE	C. J. W. Tibbetts, 1813 Broadway	Helena, Mont.
7 IF	R. M. Dansfield, 727 Blair Blvd	Eugene, Ore.
7 IG	P. B. Jackson, 434 Broadway	Seaside, Ore.
7 IH	G. W. Selvidge, 4321 9th Ave. N. E	Seattle, Wash.
7 II	A. B. Rotering, Box 43	Glasgow, Mont.
7 IJ	Everett Dunnette, 892 S. 12th St	Salem, Ore.
7 IK	Harry H. Olson, 310 4th Ave	Seaside, Ore.
7 IL	T. C. Hall, 1126 Taylor St	Eugene, Ore.
7 IM	W. D. Thomson, 1414 E. John St	Seattle, Wash.
7 IN	A. L. Adams, 321 W. Main St	Silverton, Ore.
7 IO	H. E. Welch, Route 8	Salem, Ore.
7 IP	A. A. McCue	Klawock, Alaska
7 IQ	Donald C. Gannon, Central Ave	Kent, Wash.
7 IR	J. R. Harris	Cohagen, Mont.
7 IS	F. W. Lawrence, 406 S. Crosby St	Tekoa, Wash.
7 IT	Roy Anderson	Ketchikan, Alaska
7 IU	Geo. Meacham	Yarrow, Wash.
7 IV	Arthur Fletcher, Woodbine St	Boise, Idaho
7 IW	P. R. Hoppe, 1633 Williamette St	Eugene, Ore.
7 IX	T. L. Estes, 318 Avenue E	Snohomish, Wash.
7 IY	Danzil Cutler	Vashon, Wash.
7 IZ	Chas. Burson, 716 42nd Ave. E	Seattle, Wash.
7 JA	E. L. Crawford, 1340 Court St	Salem, Ore.
7 JB	F. H. Stephens, 63 68th St	Portland, Ore.
7 JC	Keith Frazier, 829 3rd Ave. S	Glasgow, Mont.
7 JD	Francis McKee, 11th & E. Court	Weiser, Idaho
7 JE	H. C. Boardman, 112 W. 5th St	Pt. Angeles, Wash.
7 JF	Clyde Anderson, 5095 Wash. St	Moscow, Idaho
7 JG	H. R. Drinker, 497 E. 16th St. N	Portland, Ore.
7 JH	J. D. Hertz	Vancouver, Wash.
7 JI	Albert McGuffin, 346 1st Ave. N	Glasgow, Mont.
7 JJ	Gough Six, Box 151	Gresham, Ore.
7 JK	F. P. Bloss, 792 E. 34th St	Portland, Ore.
7 JL	Waverly Miller, 1704 E. 14th Ave	Spokane, Wash.
7 JM	O. R. Anderson, 1114 E. Market St	Portland, Ore.
7 JN	Roy Rice	Wapinitia, Ore.
7 JO	Marvin Larsen, 2024 Spofford St	Spokane, Wash.
7 JP	P. W. Dann, Box 974	Astoria, Wash.
7 JQ	R. A. Gould	Basin, Wyo.
7 JR	C. L. Pitcher, 723 E. 5th St	Moscow, Idaho
7 JS	L. C. Tate, 807 6th St	Anacortes, Wash.
7 JT	O. S. Van Olinda	Vashon, Wash.
7 JU	J. M. Morris, 650 12th Ave. E	Eugene, Ore.
7 JV	H. M. Moon, R.F.D. No. 2	Meridion, Idaho
7 JW	J. D. Tait, 851 E. 26th St. S	Portland, Ore.
7 JX	A. E. Wilkinson, 1919 2nd St	Baker, Ore.
7 JY	Bruce Duncan, 923 31st St. N	Billings, Mont.
7 JZ	R. B. Curnutt, 703 9th Ave. S	Great Falls, Mont.
7 KA	C. B. Collier, 311 Diamond Ave	Millyard, Wash.
7 KB	E. M. Sheets	Oak Grove, Ore.
7 KC	R. R. Zylstra	Lynden, Wash.
7 KD	Herbert Wurst, 8 Jensen Apts	Glasgow, Mont.
7 KE	L. L. Baker	Myrtle Point, Ore.
7 KF	T. D. Ferguson, 1258 Chemekita St	Salem, Ore.
7 KG	S. A. Wicks, 712 W. Meeker St	Kent, Wash.
7 KH	L. E. Shatto, 426 15th St	Astoria, Ore.
7 KI	H. W. Bidlinghafer, Shannon Hotel	Glasgow, Mont.
7 KJ	W. McGoffin, 450 Chinault St	Hoquim, Wash.
7 KK	L. P. Crowson, 896 Boulevard	Ashland, Ore.
7 KL	V. H. Dale, 432 Terrace St	Ashland, Ore.
7 KM	W. O. Nicholson, 3115 S. 8th St	Tacoma, Wash.
7 KN	Wm. Haferkorn	Clinton, Wash.
7 KO	Paul E. Lung, 936 S. Grant St	Tacoma, Wash.
7 KP	James Holcombe, 137 N. 79th St	Seattle, Wash.
7 KQ	C. L. Stephens, 1166 Alder St	Eugene, Ore.
7 KR	T. E. Olson, 528 Market St	Portland, Ore.
7 KS	A. H. Whittle, 7 Grand Ave	Astoria, Ore.
7 KT	R. A. Denham	Prairie City, Ore.
7 KU	W. K. McIntosh, 1395 Rodney Ave	Portland, Ore.
7 KV	M. W. Edwards	Camp Lewis, Wash.
7 KW	G. H. Metcalf, 1443 W. 53rd St	Seattle, Wash.
7 KX	Errol Hurtt, 250 N. Miller St	Burley, Idaho
7 KY	C. E. Anderson, 317 6th St	Marshfield, Ore.
7 KZ	F. C. Ashall, 536 N. Warren St	Helena, Mont.
7 LA	David Phillips, 6601 Union Ave	Tacoma, Wash.
7 LB	Alvin Stenso, 1922 S. J St	Tacoma, Wash.
7 LC	Eugene Zalusky, 8257 Stroud Ave	Seattle, Wash.
7 LD	O. F. Torgeson, 7044 17th Ave. N. W	Seattle, Wash.
7 LE	H. E. Redeker, 1213 17th St. N	Boise, Idaho
7 LF	E. A. Kraft, 5042 11th Ave. N. E	Seattle, Wash.
7 LG	J. C. Burke, 1186 E. Lincoln St	Portland, Ore.
7 LH	C. P. Cowper, 1419 Boulder Ave	Helena, Mont.
7 LI	C. D. Brumbaugh, 354 Central Ave	Marshfield, Ore.
7 LJ	W. W. Bonar	Plainview, Ore.
7 LK	J. R. Mendenhall, 1007 6th St	Boise, Idaho
7 LL	Wm. Carleton, 4302 Navada Ave	Seattle, Wash
7 LN	L. L. Martin	Nampa, Idaho
7 LM	D. E. Oberg, 617 S. 5th St	Yakima, Wash.
7 LO	W. C. Burkhart, 1700 Denver St	Boise, Idaho
7 LP	J. D. Killgreen	Milwaukee, Ore.
7 LQ	K. C. Preuitt, 803 8th Ave. N. W	Helena, Mont.
7 LR	Royal Howard, 425 Ellsworth St	Albany, Ore.
7 LS	Hunter Anstine	Ferndale, Wash.
7 LT	D. H. Vollmer, 1205 Worden Ave	Klamath Falls, Ore.
7 LU	F. N. Mitchell	Greybull, Wyo.
7 LV	H. E. Rankin, 2310 Hyde St	Salem, Ore
7 LW	Ray T. White, 51 E. 24th St. N	Portland, Ore
7 LX	Arthur Lindsley, R.F.D. No. 3	Oregon City, Ore
7 LY	H. F. Cutting, 420 W. Hoch St	Bozeman, Mont.
7 LZ	R. T. Thelberg, 4230 Brooklyn Ave	Seattle, Wash.
7 MA	E. V. Olson, 223 W. 29th Ave	Spokane, Wash.
7 MB	H. F. Osterburg, 621 S. Jackson St	Butte, Mont.
7 MC	M. V. Moller	Myrtle Point, Ore.
7 MD	C. F. Osterman, 1140 Court St	Salem, Ore.
7 ME	C. V. Finch, 201 S. 6th St	Bozeman, Mont.
7 MF	Arthur Smith, 261 Jefferson St	Eugene, Ore.
7 MG	A. L. Sams, 468 Helman St	Ashland, Ore.
7 MH	E. J. Gerdon, 320 Summit Ave. N	Seattle, Wash
7 MI	H. S. Horton	Lynden, Wash.
7 MJ	Jack Stranger, 1215 E. 3rd Ave	Spokane, Wash.
7 MK	H. J. Jilg, Jr., 2727 32nd Ave. S	Seattle, Wash
7 ML	D. D. Smith, Collister St	Boise, Idaho
7 MM	Frank Pugh	Philomath, Ore.
7 MN	R. V. Bishop, 2124 W. York St	Spokane, Wash.
7 MO	H. C. Buffum	Oswego, Ore.
7 MP	Ralph Lindahl	Bozeman, Mont.
7 MQ	L. L. Long	Cornelius, Ore.
7 MR	Carl Soderlund, 116 13th St	Vancouver, Wash.
7 MS	E. H. Hughes, Main St	Hillsboro, Ore
7 MT	P. H. Euler, 1819 Commercial St	Astoria, Ore.
7 MU	P. F. Peyton, 1060 S. Commercial St	Salem, Ore.
7 MV	F. L. Edwards, Route 8, Box 39	Yakima, Wash
7 MW	H. W. Edmondson, 637 N. 14th St	Corvallis, Ore
7 MX	Raymond E. Stien, 339 Jefferson St	Eugene, Ore.
7 MY	J. R. Hill, 703 9th Ave. E	Eugene, Ore.
7 MZ	Asa Phillips	Tenino, Wash
7 NA	E. E. Ames, 349 N. 32nd St	Portland, Ore
7 NB	H. O. McCoy, 4328 Park Ave	Tacoma, Wash
7 NC	R. W. Morse, 955 13th Ave. W	Seattle, Wash.
7 ND	Roland Sudman, 115 W. 20th St	Olympia, Wash.
7 NE	C. J. McClure	Leavenworth, Wash.
7 NF	F. F. Henriot	Winlock, Wash
7 NG	Edwin Floquist, 634 9th St	Bremerton, Wash.
7 NH	J. C. Wilson, 295 N. 24th St	Portland, Ore.
7 NI	F S. Flesher, 387½ Burnside St	Portland, Ore
7 NJ	G. A. Hunter, 518 Willow St	Pt. Townsend, Wash
7 NK	H. R. Hildreth, 2064 23rd St. N	Seattle, Wash
7 NL	G. E. Langford, 2927 Ash St	Spokane, Wash.
7 NM	K. C. Evening School, 290 Grand Ave	Portland, Ore

7 NN	D. E. McGee, 616 5th St	Hoquium, Wash.
7 NO	E. K. Carriere, 337 Morris St	Portland, Ore.
7 NP	B. J. Glein	Gig Harbor, Wash.
7 NQ	F. L. Canty	Eatonville, Wash.
7 NR	H. V. Koontz	Buffalo, Wyo.
7 NS	F. H. Alverdes, 142 E. 47th St	Portland, Ore.
7 NT	Cecil Hughes, 601 7th Ave. S	Glasgow, Mont.
7 NU	E. J. Moe, 1209 S. Ivanhoe St	Portland, Ore.
7 NV	G. C. Henry, 1214 1st Ave. S	Great Falls, Mont.
7 NW	E. L. Clark, 2301 Cherry St	Hoquium, Wash.
7 NX	J. J. Wilson, 34 E. 62nd St	Portland, Ore.
7 NY	J. E. Watson, Route 2	Forest Grove, Ore.
7 NZ	V. C. Henkle	John Day, Ore.

7 OA	William Thurber, 300 N St	Hoquium, Wash.
7 OB	Arthur Hagerman, Y.M.C.A	Baker, Ore.
7 OC	H. H. Clark, 386 E. 11th St	Reedsport, Ore.
7 OD	M. B. McBride, Jr., 1031 N. 23rd Ave	Seattle, Wash.
7 OE	S. M. Mathes, 561 Burwell Ave	Bremerton, Wash.
7 OF	C. V. Johnson, 1014 Glass Ave	Spokane, Wash.
7 OG	E. A. Elge, 418 N. Benton St	Helena, Mont.
7 OH	G. S. Felkert, 402 N. 17th St	Corvallis, Ore.
7 OI	P. M. Smith, R.F.D. No. 3	Powell, Wyo.
7 OJ	L. U. Bennett	Pt. Townsend, Wash.
7 OK	Frederick Koelsch, 103 Jefferson St	Boise, Idaho
7 OL	Roy Smith, 202 1st St. S	Burley, Idaho
7 OM	Harold Woodyard	Sunnyside, Wash.
7 ON	Sheldon Hagen, 807 24th Ave	Seattle, Wash.
7 OO	G. O. Leonard, 1827 4th Ave. W	Seattle, Wash.
7 OP	H. E. Williamson, 316 Union St	Seattle, Wash.
7 OQ	R. E. Peratovich	Bay View, Alaska
7 OR	A. H. Lillibridge, 506 E. A St	Moscow, Idaho
7 OS	C. F. Burdick	Casper, Wyo.
7 OT	B. B. Bliss, Jr., 417 Bannock St	Boise, Idaho
7 OU	W. M. Stockdale	Prosser, Wash.
7 OV	F. J. Campbell, 2nd St. N	Forest Grove, Ore.
7 OW	Edwin Eby, 782 Front St	Salem, Ore.
7 OX	W. A. Hazlewood	Myrtle Point, Ore.
7 OY	J. R. Truman, 848 Ocean Dr	Bandon, Ore.
7 OZ	Garrett Lewis, 767 Hawthorne Ave	Portland, Ore.

7 PA	H. W. Randall, 1212 Star Rt. St	Pullman, Wash.
7 PB	R. T. Jones, 116 Edison St	Portland, Ore.
7 PC	Herbert Chase, 2010 Water St	Olympia, Wash.
7 PD	B. C. Hendricks	Cornelius, Ore.
7 PE	Clyde Hudson	Cloverdale, Ore.
7 PF	Glen Goudie, 2818 Victor Pl	Everett, Wash.
7 PG	K. H. Ellerbeck, 2019 Knob Hill	Seattle, Wash.
7 PH	R. M. Gardner, R. A. Box 292-A	Eugene, Ore.
7 PI	R. J. Moore, 115 1st St	Wolf Point, Mont.
7 PJ	D. P. Scaife, 288 8th St	Marshfield, Ore.
7 PK	D. K. Boyd, 2nd Ave	Glasgow, Mont.
7 PL	C. H. Ackerman, 305 5th St. S	Glasgow, Mont.
7 PM	Manning, H. C., 4324 8th Ave. N. E	Seattle, Wash.
7 PN	B. L. Davis, 8523 12th Ave. N. W	Seattle, Wash.
7 PO	G. E. Kinsey, 907 W. 58th St	Seattle, Wash.
7 PP	Stadium High School, 1st & E Sts	Tacoma, Wash.
7 PQ	Arthur Harding, 1120 N. 97th St	Seattle, Wash.
7 PR	Leland Harris, 3232 38th Ave. S. W	Seattle, Wash.
7 PS	Arthur Randall, 2802 22nd Ave	Seattle, Wash.
7 PT	E. P. Coulter, 529 3rd St	Helena, Mont.
7 PU	E. L. Hansen, R.F.D. No. 2	Powell, Wyo.
7 PV	J. M. Dickenson, 1759 A St	Corvallis, Ore.
7 PW	C. W. Gabrielson	Puyallup, Wash.
7 PX	L. A. Kobe	Powell, Wyo.
7 YP	Hans Waale	Nampa, Idaho
7 PZ	Walter Bone	Carneyville, Wyo.

7 QA	H. M. Hassell, 120 E. 60th St	Seattle, Wash.
7 QB	Kenneth Field, 306 E. Olive St	Seattle, Wash.
7 QC	J. F. Bunting, 1907 1st Ave. W	Seattle, Wash.
7 QD	D. H. Bunch, Lake Shore Dr	Seattle, Wash.
7 QE	W. H. Motz, 4608 J St	Tacoma, Wash.
7 QF	S. W. Ostrom, 4840 84th St. S. E	Portland, Ore.
7 QG	G. R. Salisbury, 1951 3rd Ave. W	Seattle, Wash.
7 QH	H. M. Reynolds, 3817 Densmore Ave	Seattle, Wash.
7 QI	J. D. Keating, 1315 Sandy Blvd	Portland, Ore.
7 QJ	Frederick Lindstrom	Powell, Wyo.
7 QK	R. R. Patrick, 320 Roosevelt St	Wenatchee, Wash.
7 QL	Alvin Flippin	Ranier, Ore.
7 QM	R. E. Welch, 1005 N. Normandie St	Spokane, Wash.
7 QN	A. Z. Lillian, 620 21st Ave. N	Seattle, Wash.
7 QO	J. C. Mitchell, Municipal Life Bldg	Seattle, Wash.
7 QP	Howard Liebe, 204 N. 22nd St	Portland, Ore.
7 QQ	Chris Engleman, Jr., 321 W. 32nd St	Vancouver, Wash.
7 QR	C. V. Annin	Myrtle Point, Ore.
7 QS	E. W. Henry, 5505 36th Ave. S. E	Portland, Ore.
7 QT	Clarence Hurd, 1514 Williamette St	Eugene, Ore.
7 QU	F. R. Cartan, 1461 Monroe St	Corvallis, Ore.
7 QV	J. Munzenrieder, 515 1st St	Helena, Mont.
7 QW	Jay Isham, 820 Dalton Ave. W	Spokane, Wash.
7 QX	F. A. Koehler, 36 Shepard Way	Corvallis, Ore.
7 QY	Victor Chambers, 10th St	Cottage Grove, Ore.
7 QZ	D. W. Cathcart, 1505 E. 66th St	Portland, Ore.

7 RA	M. A. Hauge, 5635 11th Ave. N. E	Seattle, Wash.
7 RB	R. C. Farrah, 700 E. 26th St	Vancouver, Wash.
7 RC	Barton Stemmler, Spruce St	Myrtle Point, Ore.
7 RD	Charles Parmelee	Sunnyside, Wash.
7 RE	N. H. Foster, North Water St	Ellensburg, Wash.
7 RF	H. E. Nelson	Onalaska, Wash.
7 RG	E. J. Hoff, 927 Irving St	Astoria, Ore.
7 RH	P. E. Nolte	Camp Lewis, Wash.
7 RI	John Soderstrom	Montesano, Wash.
7 RJ	G. O. Campbell, 2443 5th Ave. W	Seattle, Wash.
7 RK	H. L. Haven, 1123 Burwell St	Bremerton, Wash.
7 RL	G. W. Garman, 1366 31st Ave. S	Seattle, Wash.
7 RM	H. A. Burgess, 9260 California Ave	Seattle, Wash.
7 RN	Kenneth Paton	Cashmere, Wash.
7 RO	R. G. Heitkemper, 439 E. 10th St. N	Portland, Ore.
7 RP	E. R. Simpson, 1004 Leonard St	Portland, Ore.
7 RQ	D. E. Replogle	Cashmere, Wash.
7 RR	Jeffrey Kilchli, 319 N. 33rd St	Billings, Mont.
7 RS	L. E. Scriven, 0-2118 Lidgerwood St	Spokane, Wash.
7 RT	E. S. Collies, 2815 Pacific Ave	Hoquium, Wash.
7 RU	N. J. Bruck, 744 Kearney St	Portland, Ore.
7 RV	William Morton, 6523 45th Ave	Portland, Ore.
7 RW	D. E. Schultz, 2423 Birch St	Astoria, Ore.
7 RX	L. S. Shields, R.F.D. No. 1, Box 21	Salem, Ore.
7 RY	L. F. Zimmerman, Owyhee St	Ontario, Ore.
7 RZ	V. B. McCulloch, 223 N. Conant Ave	Burley, Idaho

7 SA	D. X. Tower, 1615 35th Ave	Seattle, Wash.
7 SB	L. E. Bracht, 1804 Batchelor St	Miles City, Mont.
7 SC	W. A. C. Hemrich, 916 Hume St	Aberdeen, Wash.
7 SD	H. L. Fritz, 707 N. 65th St	Seattle, Wash.
7 SE	T.L.Richardson, U.S.O.H.S.Hospital 159	Tacoma, Wash.
7 SF	E. E. Griggs, 1518 1st St	Aberdeen, Wash.
7 SG	Don Harris, 1711 Simpson St	Aberdeen, Wash.
7 SH	A. J. Homchick, 904 1st St	Aberdeen, Wash.
7 SI	Hal Garrott, 4320 Meridian Ave	Seattle, Wash.
7 SJ	R. P. Heatlie, 324 F St	Aberdeen, Wash.
7 SK	C. C. Howard, 218 E. 63rd St. N	Portland, Ore.
7 SL	L. C. McManemy, 1309 Hood St	Aberdeen, Wash.
7 SM	C. T. Hanes, 906 19th Ave. N	Seattle, Wash.
7 SN	R. G. Wascher, 760 12th Ave	Seaside, Ore.
7 SO	W. L. Duncan, 142 11th St	Corvallis, Ore.
7 SP	M. W. Rice, 497 E. 28th St	Portland, Ore.
7 SQ	R. F. Parslow, 522 S. Main St	Roseburg, Ore.
7 SR	R. S. Bean, 579 E. 9th St	Eugene, Ore.
7 SS	W. F. Turnbow, 704 W. 4th St	Aberdeen, Wash.
7 ST	M. C. Knight, 3645 35th St. W	Seattle, Wash.
7 SU	J. A. Kindle, 230 Sam St	Monroe, Wash.
7 SV	D. G. Harvie, 205 Montgomery St	Albany, Ore.
7 SW	C. M. Landaker, R.F.D. No. 4, Box 17-A	Salem, Ore.
7 SX	C. L. Hyer, 815 Thurston St	Albany, Ore.
7 SY	G. M. de Broekert, 345 Mill St	Eugene, Ore.
7 SZ	F. M. Curtin, 530 Thomas St	Hillyard, Wash.

7 TA	R. K. Leonard, 421 N. Belmont St	Seattle, Wash.
7 TB	V. R. Kem, 1509 W. Main St	Cottage Grove, Ore.
7 TC	G. C. Perry, 3712 Woodlawn Ave	Seattle, Wash.
7 TD	G. M. Leasia, 116 Heron St	Aberdeen, Wash.
7 TE	G. C. Henny, 530 Heights Terr	Portland, Ore.
7 TF	J. K. Trescott, 504 N. 31st St	Billings, Mont.
7 TG	M. E. Tait, 394 Guild St	Portland, Ore.
7 TH	A. W. Emigh, 335 Grove St	Walla Walla, Wash.
7 TI	H. T.Hayden, Jr., Monroe St	Pt. Townsend, Wash.
7 TJ	C. A. Lockwood, 2117 S. 12th St	Salem, Ore.
7 TK	R. W. Mudgett	Powell, Wyo.
7 TL	H. J. E. Young, 1163 E. 17th St. N	Portland, Ore.
7 TM	A. H. Peterson, 2304 N. 39th St	Seattle, Wash.
7 TN	J. B. Darragh, Jr., 2560 5th Ave. W	Seattle, Wash.
7 TO	Arvid Herner, 119 E. Harrison St	Portland, Ore.
7 TP	J. C. Campbell	Camp Lewis, Wash.
7 TQ	H. H. Howell, Route 2, Box 15	Medford, Ore.
7 TR	H. R. Andrews, 635 Olympia St	Bremerton, Wash.
7 TS	John Pollak, 811 Washington St	Albany, Ore.
7 TT	W. E. Burke, 7126 54th Ave. S. E	Portland, Ore.
7 TU	W. R. Barrett, 5432 S. L St	Tacoma, Wash.
7 TV	H. D. Hall	Cascade, Mont.
7 TW	L. G. Perry, R.F.D. No. 2	Eugene, Ore.
7 TX	H. R. Fullerton, 210½ N. Minor St	Seattle, Wash.
7 TY	E. C. Parks, 8th & Cedar Sts	Port Angeles, Wash.
7 TZ	G. R. Shockley, S. Water St	Silverton, Ore.

7 UA	Josephine Ralston, 627 Baker St	Albany, Ore.
7 UB	Carl McDowell, 906 W. 4th St	Eugene, Ore.
7 UC	G. T. Mood, 4526 52nd Ave. S. W	Seattle, Wash.
7 UD	D. R. Packard, 3rd Ave	LaConner, Wash.
7 UE	G. H. Clinefelter, 2nd & C Sts	Oswego, Ore.
7 UF	Ivar Wallin	Chignig, Alaska
7 UG	Hugo Osterman, 508 Lincoln St	Walla Walla, Wash.
7 UH	R. D. Glasgow	Cody, Wyo.
7 UI	K. B. Duxbury, 720 Central St	Olympia, Wash.
7 UJ	F. G. Frobese, 103 5th Ave. N	Seattle, Wash.
7 UK	R. H. Millsap, 1235 Taggert St	Portland, Ore.
7 UL	Jack Hohenberg, 1434 20th Ave	Seattle, Wash.
7 UM	Brannon Casler, 3306 W. 71st St	Seattle, Wash.
7 UN	G. W. Beller, 1438 20th Ave	Seattle, Wash.
7 UO	M. F. Judkins, 300 Denny Way	Seattle, Wash.
7 UP	M. J. Gross, 124 Skidmore St	Portland, Ore.
7 UQ	R. B. Wallitner	Pt. Angeles, Wash.
7 UR	C. M. Cruikshank, Jr., 626 5th Ave. N	Glasgow, Mont.
7 US	A. K. Robinson, 2317½ E. Union St	Seattle, Wash.
7 UT	E. J. Overman, 877 Cleveland St	Portland, Ore.
7 UU	Robert Waskey, 7213 28th Ave	Seattle, Wash.
7 UV	C. J. Stubbs, 6129 94th St. S. E	Portland, Ore.
7 UW	John Weisner, 322 5th St	McMinnville, Ore.
7 UX	H. A. Wilson, 365 14th St	Astoria, Ore.
7 UY	L. F. Kempfle	Glasgow, Mont.
7 UZ	H. K. Lawson, 508 W. 23rd St	Vancouver, Wash.

7 VA	Douglas Hartman, 110 Carlisle St	Onalaska, Wash.
7 VB	D. E. Brombaugh	Oswego, Ore.
7 VC	Raymond Byrne, 10th Co. C.A.C	Ft. Casey, Wash.
7 VD	B. N. Beighle	Kalama, Wash.
7 VE	H. J. Carey, 289 Ivy St	Portland, Ore.
7 VF	B. W. Powell, 793 Michigan Ave	Portland, Ore.
7 VG	E. A. Fampbell, 414 E. 10th St	Olympia, Wash.
7 VH	C. V. Zehrung, 5123 58th St. S. E	Portland, Ore.
7 VI	F. G. Bargfeld, 544 E. 20th St. S	Portland, Ore.
7 VJ	Flor. A. Tingstad, 842 Blaine St	Pt. Townsend, Wash.
7 VK	Kenneth Golden, 402 Sanson Ave	Hillyard, Wash.
7 VL	Willard Barzee, 126 E. 15th St	Portland, Ore.
7 VM	Roy Bucy, 2123 4th Ave. W	Seattle, Wash.
7 VN	D. Huntington	Kalama, Wash.
7 VO	M. K. Baughman, 219 S. Central Ave	Medford, Ore.
7 VP	John Wandelt, 949 N. 82nd St	Seattle, Wash.
7 VQ	Merlynn Alloway, 930 N. 85th St	Seattle, Wash.
7 VR	John C. Nelson, Richland Highlands	Seattle, Wash.
7 VS	Temple Ehmsen, 1408 Montana St	Portland, Ore.
7 VT	F. L. Wiederhold, 92 N. 17th St	Portland, Ore.
7 VU	H. C. Crabtree, 520 13th St	Eugene, Ore.
7 VV	H. H. Napper, 512 13th St	Boise, Idaho
7 VW	W. H. Johnson, 1436 53rd Ave	Seattle, Wash.
7 VX	George Freeman, 5411 S. I. St	Tacoma, Wash.
7 VY	R. H. Cornell, 124 Skidmore St	Portland, Ore.
7 VZ	Brandon Wentworth	Libby, Mont.

7 WA	L. Palmer, 1111 G St	Centralia, Wash.
7 WB	F. E. Chambers, 1200 Williams Ave	Portland, Ore.
7 WC	E. M. Hanford, 825 E. State St	Boise, Idaho
7 WD	R. S. Burghoffer, 1215 Taylor St	Bellingham, Wash.
7 WE	C. E. Munsell, 117 S. Chelan St	Wenatchee, Wash.
7 WF	P. A. Meland, 615 Boren Ave	Seattle, Wash.
7 WG	W. J. Sutherlin, Box 446	Nez Perce, Idaho
7 WH	Seattle College, 2440 Interlaken Ave	Seattle, Wash.
7 WI	C. F. Bates, 1021 J St	Hoquium, Wash.
7 WJ	Billy Webb, 1227 Ivon St	Portland, Ore.
7 WK	H. S. Westerlund, 467 Sumner St	Portland, Ore.
7 WL	B. G. Griffith, 7604 59th Ave	Portland, Ore.
7 WM	Theodore Bentz, 610 S. Tacoma Ave	Tacoma, Wash.
7 WN	C. F. Savage, Jr., 6029 44th St. S. E	Portland, Ore.
7 WO	Paul Klev, 999 Borthwick St	Portland, Ore.
7 WP	Martin Amdahl, Box 433	Great Falls, Mont.
7 WQ	H. C. Coxon, 2631 43rd St	Portland, Ore.
7 WR	J. F. Nelson	Gibbs, Idaho
7 WS	H. W. Shane, 1059 Burwell St	Bremerton, Wash.
7 WT	L. F. Caldwell, 803½ Water St	Portland, Ore.
7 WU	J. J. Tuerck, 495 Harrison St	Portland, Ore.
7 WV	J. E. Reardon	Fort Worden, Wash.
7 WW	K. H. Cramer	Pt. Angeles, Wash.
7 WX	G. C. Miller, 1005 E. Div. Lane	Tacoma, Wash.
7 WY	L. C. Graham, 812 Terrace Ave	Aberdeen, Wash.
7 WZ	M. A. Obradovic, 5103 Meridian Ave	Seattle, Wash.

7 AAB	C. C. Simonson, Electric Bldg	Billings, Mont.
7 AAC	Dick Wimpy, 1618 E. 3rd St	Spokane, Wash.
7 AAD	Hermon Semenov, 549 E. 26th St	Portland, Ore.
7 AAE	A. C. Doty, 426 S. 4th St	Corvallis, Ore.
7 AAF	Ray Davies, 3827 S. 9th St	Tacoma, Wash.
7 AAG	T. E. Paine	Leavenworth, Wash.
7 AAH	P. MacCormac, 303 W. Pacific St	Spokane, Wash.
7 AAI	H. Livingstone, 1201 25th Ave. N	Seattle, Wash.
7 AAJ	R. E. Ring, 207 Vista St	Ashland, Ore.
7 AAK	W. C. Lester	Warrenton, Ore.
7 AAL	F. L. Davis, 404 Yakima St	Wenatchee, Wash.
7 AAM	J. A. Renhard	Colton, Ore.
7 AAN	P. H. Kemp, 873½ E. Oak St	Portland, Ore.
7 AAO	Robert Clark, P. O. Box 276	Bremerton, Wash.
7 AAP	Fl. Horsfall, Jr., 403 18th Ave. N	Seattle, Wash.
7 AAQ	R. E. Fleming, 1615 Harrison St	Seattle, Wash.
7 AAR	C. R. Whitcomb, 1555 Monroe St	Corvallis, Ore.
7 AAS	T. A. Fraser, 320 Power St	Helena, Mont.
7 AAT	C. E. Rodman, Mayhew St	Sunyside, Wash.
7 AAU	R. W. Hurd, 505 King St	Aberdeen, Wash.
7 AAV	K. E. Fitch, 115 S. Mission St	Wanatchee, Wash.
7 AAW	S. C. Jayne, 808 W. 13th St	Spokane, Wash.
7 AAX	H. S. Pfirman, 1308 E. State St	Boise, Idaho
7 AAY	M. L. Flengstad, 443 15th St	Bellingham, Wash.
7 AAZ	W. E. Campbell, R.F.D. No. 2	Wenatchee, Wash.

7 ABA	F. L. Gilcrist, 3226 E. 5th Ave	Spokane, Wash.
7 ABB	C. E. Kick, 3802 Hoyt Ave	Everett, Wash.
7 ABC	V. W. Burlingame, 1905 3rd Ave. N	Great Falls, Mont.
7 ABD	D. G. Hamrick, 7151 4th Ave. S. W	Seattle, Wash.
7 ABE	F. B. Harper, 9730 13th Ave. S. W	Seattle, Wash.
7 ABF	R. H. Flagler, 809 E. 62nd St	Seattle, Wash.
7 ABG	M. W. Belsher, 1011 E. Jefferson St	Boise, Idaho
7 ABH	Laried Jenkins, 444 N. Conant St	Burley, Idaho
7 ABI	R. M. Hess, 443 14th St	Bellingham, Wash.
7 ABJ	R. T. Carr, 119 N. Post St	Spokane, Wash.
7 ABK	D. L. Woodward, University St	Eugene, Ore.
7 ABL	E. H. Bryan, 916 E. 33rd Ave	Spokane, Wash.
7 ABM	C. F. Mancke, 513 E. Bridgeport Ave	Spokane, Wash.
7 ABN	J. H. Anderson, 619 Summit Ave. N	Seattle, Wash.
7 ABO	E. E. Storrs, 228 Chelan St	Wenatchee, Wash.
7 ABP	Chas. Melander, 702 Campus St	Pullman, Wash.
7 ABQ	K. M. Simpson	Gaston, Ore.
7 ABR	O. K. Hawley, 1604 E. 10th St	Olympia, Wash.
7 ABS	E. W. Wilson, 4527 12th Ave. N. E	Seattle, Wash.
7 ABT	Gerald Brill, 2932 Dean St	Spokane, Wash.
7 ABU	Leno Nelson, 16th Ave. & 11th St	Seaside, Ore.
7 ABV	W. R. Wood, 630 Burwell Ave	Bremerton, Wash
7 ABW	E. H. Bailey, 721 Gregory Way	Bremerton, Wash
7 ABX	G. C. Stocking, 689 E. Alder St	Portland, Ore.
7 ABY	J. M. Ahearn, 408 N. Main St	Milton, Ore.
7 ABZ	C. R. Siegel, 912 Broadway	Helena, Mont.

7 ACA	Paul Comings, 712 4th St	Bremerton, Wash.
7 ACB	R. J. Spragg	Brush Prairie, Wash.
7 ACC	W. B. Franson, 1515 3rd Ave. N	Great Falls, Mont.
7 ACD	E. J. Geil, 1511 E. 3rd Ave	Spokane, Wash.
7 ACE	D. T. Shaw	Emmett, Idaho
7 ACF	L. L. Peak	Buhl, Idaho
7 ACG	R. G. Thornburgh	Forest Grove, Ore.
7 ACH	Arthur Seiler, Jr., 729 11th Ave	Helena, Mont.
7 ACI	G. B. Horne, 2204 Fairmount Ave	Seattle, Wash
7 ACJ	J. M. Kelly, 711 N. Superior St	Spokane, Wash.
7 ACK	L. C. Troyer, 1217 S. Adams St	Spokane, Wash
7 ACL	A. V. Kendall, Gray Avenue	Weiser, Idaho
7 ACM	C. S. Chapman	Cambridge, Wash
7 ACN	D. D. Latonrell, R. 3, Box 7	Salem, Ore.

EXPERIMENTAL STATIONS

7 XA	Portland, Ore., 270½ 3rd St	Radio Corp. of Am.
7 XB	Bozeman, Mont.	Mont. State College
7 XC	Seattle, Wash., 8838 19th Ave. N. E	V. I. Kraft
7 XD	Billings, Mont.	Polytechnic Institute
7 XF	Portland, Ore., 1556 E. Taylor St	C. L. Austin
7 XG	Portland, Ore., 400 E. 22nd St. N	W. P. Hawley, Jr
7 XJ	Seattle, Wash., 2922 3rd Ave	C. W. Peterson
7 XK	Seattle, Wash., 3450 E. MarginalWay	K. & C. Mfg. Co
7 XZ	Seattle, Wash.,	Campus University of Wash
7 YA	Boise, Idaho	Sch. Dist. No. 10
7 YB	Eugene, Ore.	University of Oregon
7 YC	Seattle, Wash., 4th & Madison	Y. M. C. A.
7 YD	Seattle, Wash., 10th & Madison	K. of C. Ev. Sch.
7 YE	Seattle, Wash., Bway & Pine	Broadway Ev. Sch.
7 YF	Burley, Idaho	Burley High School
7 YG	Portland, Ore.	Y. M. C. A.
7 YH	Portland, Ore.	Wash. High School
7 YJ	Corvallis, Ore.	Oregon Agri. College
7 YK	Portland, Ore., 12th & Hoyt Sts	Benson Poly. Inst.
7 YL	Spokane, Wash., Howard & Nora Sts	No. Cent. High Sch.
7 YM	Seattle, Wash., Interlaken & 43rd	Lincoln High Sch
7 YS	Lacy, Wash.	St. Martins College

SPECIAL AMATEUR STATIONS

7 ZB	Portland, Ore., 555 44th St	W. A. Leidigh, Jr.
7 ZD	Boseman, Mont., 222 S. Black St	R. E. Daws
7 ZE	Elk, Wyoming	H. P. Sheard
7 ZG	Bear Creek, Mont.	W. E. Slauson
7 ZH	Enterprise, Ore.	O. M. Heacock
8 ZJ	Vancouver, Wash.	Royal Mumford
7 ZK	Vancouver, Wash., 706 W. 12th St	V. J. Bird
7 ZM	Moscow, Idaho	Jack Woodworth
7 ZO	Casper, Wyoming	N. R. Hood
7 ZP	Olympia, Wash., 2201 Columbia St	E. W. Wilson
7 ZS	Pullman, Wash.	H. E. Allen
7 ZT	Portland, Ore., 967 Vernon Ave	G. B. Critesei
7 ZV	Thompson, Felix	Douglas, Wyo.

Eighth District

8 AOA	W. W. McCoy, 2925 Espy Ave	Dormont, Pa.
8 AOB	S. J. Bentler, 63 Hughes Ave	Buffalo, N. Y.
8 AOC	F. Schaefer, 1716 Vine St	Cincinnati, O.
8 AOD	P. B. Lewis, 727 Northumberland Ave	Buffalo, N. Y.
8 AOE	W. A. Seaman, 319 Elm St	Findlay, O.
8 AOF	A. A. Reiser, 42 Meech St	Buffalo, N. Y.
8 AOG	F. Furlong, 733 N. River St	Ypsilanti, Mich.
8 AOH	J. T. Chidester, 661 W. Pike St	Clarksburgh, W. Va.
8 AOI	L. G. Windom, 1375 Franklin Ave	Columbus, O.
8 AOJ	M. Kookle, 226 N. Washington St	Van Wert, O.
8 AOK	J. J. Farrell, 185 School St	Buffalo, N. Y.
8 AOL	R. Folzenlogen, 1714 Queen City Ave	Cincinnati, O.
8 AOM	V. Ball, 52 Hammerschmidt St	Buffalo, N. Y.
8 AON	C. K. Hunt, 141 Arden Park	Detroit, Mich.
8 AOO	E. M. Formili, 117 Easy St	Uniontown, Pa.
8 AOP	I. L. Lindow, 2256 Auburn Ave	Toledo, O.
8 AOQ	T. W. Hood, Westminster College	N. Wilmington, Pa.
8 AOR	E. W. Grenloch	Chagrin Falls, O.
8 AOS	E. L. Sharp, 151 Chapin St	Binghamton, N. Y.
8 AOT	C. Rossback, 15 S. McNab Ave	Gloversville, N. Y.
8 AOU	C. C. Mosher, Jr., 1044 W. Market St	Lima, O.
8 AOV	E. Webb, 117 E. Main St	New London, O.
8 AOW	H. T. Williams, 55 Warren Ave	Youngstown, O.
8 AOX	N. J. Herrick, Jr., 19 Reed St	Canajoharie, N. Y.
8 AOY	L. F. Huber, 24 Garfield St	Lancaster, N. Y.
8 AOZ	E. S. White, 503 N. James St	Rome, N. Y.
8 APA	E. Simons, 257 Howard St	Detroit, Mich.
8 APB	J. C. Waddington, White St	Clark Mills, N. Y.
8 APC	F. L. Hancock, 8 Argyle St	Geneva, N. Y.
8 APD	W. Ward, 4603 Ward St	Cincinnati, O.
8 APE	H. E. Fraser, R.F.D. No. 5	Pontiac, Mich.
8 APF	B. C. Rogers, 417 Dithridge St	Pittsburgh, Pa.
8 APG	South High School, Broadway & Fullerton Sts,	Cleveland, O.
8 APH	F. J. Boerder, 4250 Collingwood Ave	Toledo, O.
8 API	E. S. Bee, 1176 South Ave	Wilkinsburg, Pa.
8 APJ	H. I. Weissleader, 181 Florida St	Buffalo, N. Y.
8 APK	H. I. Doering, 612 W. Anglaize St	Wapakoneta, O.
8 APL	T. Weld	Ashville, N. Y.
8 APM	R. J. Roseburg, 231 Erie St	Port Huron, Mich.
8 APN	C. L. Zahm, 418 Eastlawn Ave	Detroit, Mich.
8 APO	Edward Smith Junior High School, Lancaster & Broad,	Syracuse, N. Y.
8 APP	H. W. Hanesworth, 235 Mithoff St	Columbus, O.
8 APQ	W. E. Lore, Jr., 124 Webb St	Detroit, O.
8 APR	S. Rieman, 2287 Loth St	Cincinnati, O.
8 APS	C. H. Geerlings, 90 W. 14th St	Holland, Mich.
8 APT	B. Moore, 794 Drexel Ave	Detroit, Mich.
8 APU	W. E. Zimmer, Court House	Mason, Mich.
8 APV	F. Dieringer, 441 McMicken Ave	Cincinnati, O.
8 APW	L. E. Caldwell & R. J. Lewis, 12511 Phillips Ave.,	East Cleveland, O.
8 APX	W. Farmariss, 7817 Hamilton Ave	Pittsburgh, Pa.
8 APY	R. Bidal, 890 St. Clair Ave	Detroit, Mich.
8 APZ	H. G. Phillips, 1213 James St	Syracuse, N. Y.
8 AQA	F. M. Thiefels, 1193 Sheridan Ave	Detroit, Mich.
8 AQB	A. C. Smith, 1182 John R. St	Detroit, Mich.
8 AQC	W. D. Forbey, 309 W. Kearsley St	Flint, Mich.
8 AQD	H. L. Norton, 810 Broadway St	Bedford, O.
8 AQE	J. Walters, 98 Lowell St	Rochester, N. Y.
8 AQF	H. Isaacs, 410 Warren St	Marietta, O.
8 AQG	V. C. Henophy, 114 Lowell St	Rochester, N. Y.
8 AQH	M. A. Kromback, Miami Ave	Cleves, O.
8 AQI	G. L. Gates, 1007 White Pl	Utica, N. Y.
8 AQJ	F. Uhrhane, 628 4th St	Marietta, O.
8 AQK	J. Nolan, State St	Bowerston, O.
8 AQL	W. A. Sweigard, 3153 Chapin Ave	Erie, Pa.
8 AQM	L. G. Morrell, 74 Carlisle St	Wilkes-Barre, Pa.
8 AQN	Olds Rod & Gun Club	Smethport, Pa.
8 AQO	A. R. Marcy, Fernwood Farm	Cazenovia, N. Y.
8 AQP	H. M. Haskell	Pleasantville, Pa.
8 AQQ	J. H. Wills, 110 Washington Ave	Pontiac, Mich.
8 AQR	H. Osgood, 643 Canton Ave	Detroit, Mich.
8 AQS	J. F. Weiss, 648 Park Ave	Amherst, O.
8 AQT	P. J. Poland, 347 W. McMillan St	Cincinnati, O.
8 AQU	L. Makley, 441 N. Front St	St. Marys, O.
8 AQV	E. M. King, 181 Elliott St	Clarksburg, W. Va.
8 AQW	F. J. Armbruster, 30 Hollister St	Buffalo, N. Y.
8 AQX	J. E. Wilson, 213 Ohio St	Avalon, Pa.
8 AQY	G. L. Leighton, 714 N. Washington St	Lansing, Mich.
8 AQZ	J. P. Weirick, 221 S. Market St	Londonville, O.
8 ARA	L.G.Hickson, Lake Ave. Baptist Church,	Rochester, N. Y.
8 ARB	M. A. McCausland, 1479 Iroquois Ave	Detroit, Mich.
8 ARC	W. P. Reinoehl, R.F.D. No. 2	Custer, Mich.
8 ARD	E. W. Wolf, 3919 Robert St	Cleveland, O.
8 ARE	L. F. Phillippi, 602 Lillibridge St	Detroit, Mich.
8 ARF	E. Price, 907 Prendergast Ave	Jamestown, N. Y.
8 ARG	S. H. Zaayer, 1040 E. Main St	Columbus, O.
8 ARH	S. R. McCinney, 3461 McFarlan Rd., Westwood,	Cincinnati, O.
8 ARI	W. F. Widenor, 721 Wheeler Ave	Scranton, Pa.
8 ARJ	O. Meiselback, 401 Franklin Ave	Bay City, Mich.
8 ARK	G. S. Mason, 119 Temple St	Fredonia, N. Y.
8 ARL	L. M. Lind, 675 Hazel St	Akron, O.
8 ARM	J. Shinbach, 2211 Warren St	Toledo, O.
8 ARN	H. T. Jenkins, 1573 Vinewood Ave	Detroit, Mich.
8 ARO	L. Biebel, 613 10th St	Oakmont, Pa.
8 ARP	G. J. Gray, 3860 Wayside Ave	Cincinnati, O.
8 ARQ	E. N. Stevvins, 419 West Ave	Medina, N. Y.
8 ARR	E. Hughes, 4340 W. Warren Ave	Detroit, Mich.
8 ARS	Union Central Life Ins. Co. (operated by W. C. Winall), 425 Union Central Bldg.,	Cincinnati, O.
8 ART	D. L. Bassler, 11 Gold St	Gloversville, N. Y.
8 ARU	W. E. Menges, 3402 Clearfield Ave	Pittsburgh, Pa.
8 ARV	H. C. Storck, 694 Carpenter St	Columbus, O.
8 ARW	E. Spon, 555 N. Oakland Ave	Sharon, Pa.
8 ARX	W. D. Buckingham, 1821 Waite Ave	Toledo, O.
8 ARY	T. R. Cummings, 333 Selden Ave	Detroit, Mich.
8 ARZ	W. L. Dominy, 247 Windemer Ave	Highland Park, Mich.
8 ASA	C. Carmean, 633 W. 5th St	Marysville, O.
8 ASB	W. F. Blake, 625 Woodward Ave	Detroit, Mich.
8 ASC	J. J. Baxter, 1548 Robinwood Ave	Lakewood, O.
8 ASD	G. M. Gilbert, 746 Chenango St	Binghamton, N. Y.
8 ASE	J. Zegler, 112 Giffen St	Canonsburg, Pa.
8 ASF	L. C. Horton, 3044 Corydon Rd	Cleveland Heights, O.
8 ASG	K. R. Smith, 302 W. Center St	Elmira, N. Y.
8 ASH	W. L. Fisher, 642 Upson St	Akron, O.
8 ASI	M. Metzger, 121 Lane St	Bucyrus, O.
8 ASJ	New Era Radio Sales Co	Elmira, N. Y.
8 ASK	C. W. Huff, 737 W. 1st St	Elmira, N. Y.
8 ASL	B. C. Belden, 160 Temple St	Fredonia, N. Y.
8 ASM	W. H. Vogler, 4140 Concord Ave	Detroit, Mich.
8 ASN	R. A. Wood, 262 Lillibridge St	Detroit, Mich.
8 ASO	E. H. Collian, 218 Connecticut Ave	Detroit, Mich.
8 ASP	R. Kelly, 209 Rhode Island Ave	Highland Park, Mich.
8 ASQ	L. Allison, 125 Moss Ave	Highland Park, Mich.
8 ASR	H. J. Rowe, 6701 Madison Ave	Cleveland, O.
8 ASS	W. G. Sloyer, 831 Clinton ave	Kalamazoo, Mich.
8 AST	N. A. Thomas, 612 7th St	Marietta, O.
8 ASU	C. M. Ralph, 546 Highland Pl	Bellevue, Pa.
8 ASV	H. C. Kauffman, 745 A St	Lorain, O.
8 ASW	F. W. Foye, 7003 Superior Ave. N. E.	Cleveland, O.
8 ASX	L. Skinner, 669 Pingree Ave	Detroit, Mich.
8 ASY	L. J. Marcus, 131 S. Union St	Olean, N. Y.
8 ASZ	L. J. Wilcox, 323 Fulton St	Sandusky, O.
8 ATA	H. W. Bower, 4316 High St	Ecorse, Mich.
8 ATB	A. D. Talmadge, 331½ Washington Ave	Lansing, Mich.
8 ATC	T. C. Howard, 2589 Stratford Rd	Cleveland Heights, O.
8 ATD	C. B. Graves, R.F.D. No. 3	Madison, O.
8 ATE	W. G. Feighner, 727 Willos St	Fremont, O.
8 ATF	A. Ciucas, 355 Summer St	Toledo, O.
8 ATG	H. J. Meister, 579 Orchard Ave	Bellevue, Pa.
8 ATH	H. L. Wadsworth	Rillton, Pa.
8 ATI	W.E.Crofton, 1106 Columbia Ter	Parkersburgh, W. Va.
8 ATJ	W.A.Merkel, 211 Greendale Ave	Clifton, Cincinnati, O.
8 ATK	D. Goldberg, 9231 Delmar Ave	Detroit, Mich.
8 ATL	F. Brettschneider, 6059 30th St	Detroit, Mich.
8 ATM	E. L. Price, 32 Hereford St	Cincinnati, O.
8 ATN	S.A.Chamberlain, 166 Grand Av. E,	Highland Park, Mich.
8 ATO	H. F. Crowell, 920 Wolf St	Fremont, O.
8 ATP	R. E. Kepler, 1005 Lippert Rd	Canton, O.
8 ATQ	J. M. Mauzy, 522 N. Main St	Sidney, O.
8 ATR	G. Schmidts, 166 Progress Ave	Hamilton, O.
8 ATS	B. E. Rask, Jr., 4 Andrain Ave	West View, Pa.
8 ATT	G. W. Sawyer, 356 Hazelwood St	Rochester, N. Y.
8 ATU	V. G. Wiley, 119 Dallas St	Sidney, O.
8 ATV	Shaker Heights High School (by L. C. Pollitz), S. Woodland & Southington Rds.,	Cleveland, O.
8 ATW	C. J. Mack, 49 McGovern Ave	Ashtabula, O.
8 ATX	J. Hampton, 231 Rockwell Ave	Pontiac, Mich.
8 ATY	H. W. Jaehn, 259 Walbridge Ave	Toledo, O.
8 ATZ	G. Murphy, 20 Walnut St	Salem, O.
8 AUA	W. K. Jeffery, 2173 Hillger Ave	Detroit, Mich.
8 AUB	W. Hay, 915 Bethune Ave	Detroit, Mich.
8 AUC	A. Coe, 134 Fourth St	Wyandotte, Mich.
8 AUD	S. Ventimiglia, 1024 Joseph Campau Ave,	Detroit, Mich.
8 AUE	J. L. Bock, Mill St	Farmington, W. Va.
8 AUF	A. Bauers, 2050 Spring Rd	Cleveland, O.
8 AUG	E. C. Sutor, 360 Fargo Ave	Buffalo, N. Y.
8 AUH	H. F. Neubauer, 3014 Euclid Heights Bvld.,	Cleveland Heights, O.
8 AUI	K. H. Keller, 1517 E. Blvd	Cleveland, O.
8 AUJ	P. Frantz, 1725 E. 89th St	Cleveland, O.
8 AUK	H. Abell, 1556 E. 86th St	Cleveland, O.
8 AUL	G. A. Schaefer, 96 Martin St	Rochester, N. Y.
8 AUM	C. E. Bassett, 906 N. Park St	Kalamazoo, Mich.
8 AUN	O. H. Ryder, 231 E. Temple St	Owego, N. Y.
8 AUO	R. G. Jacobus, 312 Beakes St	Ann Arbor, Mich.
8 AUP	J. Kucera, 3459 E. Blvd	Cleveland, O.
8 AUQ	S. Tucker	Marlette, Mich.
8 AUR	C. W. Vogel, 129 S. Van Lear St	Dayton, O.
8 AUS	T. Webner, Jr., 410 Walnut St	Sewickley, Pa.
8 AUT	H. P. Davis, 1125 Forest Rd	Lakewood, O.
8 AUU	T. L. Witter, 1611 Shorb Ave. N. W.	Canton, O.
8 AUV	H. J. Hill, 1372 W. 85th St	Cleveland, O.
8 AUW	R. L. Thomas, 1126 Neil Ave	Columbus, O.
8 AUX	G. Z. Jackson, 1289 W. 76th St	Cleveland, O.
8 AUY	J. Leighner, 606 E. Pearl St	Butler, Pa.
8 AUZ	E. Brandt, 3333 Seymour Ave	Cleveland, O.
8 AVA	M. Duffy, 341 S. Cavalry Ave	Detroit, Mich.
8 AVB	J. & R. Dando, 35 W. Miami Blvd	Dayton, O.
8 AVC	E.W.Hartman, 1114 Stockbridge Ave	Kalamazoo, Mich.
8 AVD	T. Tappan, 547 Clark St	Waverly, N. Y.
8 AVE	K. W. Busch, 637 Englewood Ave., R.F.D. No. 2, Station H,	Buffalo, N. Y.
8 AVF	D. C. Frick, 908 11th St	New Brighton, Pa.
8 AVG	A. Z. Blair, Jr., 5th & Courth Sts	Portsmouth, O.
8 AVH	R. Lynn, 211 High St	Xenia, O.
8 AVI	K. Breon, 138 Washington St	Williamsport, Pa.
8 AVJ	O. Miller, 47 Barclay St	Canajoharie, N. Y.
8 AVK	C. E. Gibson, 3 Spring St	Athens, O.
8 AVL	H. E. Butler, 456 Mahoning St	Lehighton, Pa.
8 AVM	W. Ellenberger, 307 Freeport St	Aspinwall, Pa.
8 AVN	H. E. Barber, 6 Hoopingarner St	Waupakoneta, O.
8 AVO	H. L. Glenn, 356 7th Ave	Columbus, O.
8 AVP	E. H. Brigham, 305 Woodbridge Ave	Buffalo, N. Y.
8 AVQ	H. C. Pease, Root Rd	Lorain, O.
8 AVR	H. E. Hotaling, 106 Forest St	Gloversville, N. Y.
8 AVS	H. E. Kenny, 911 Elmwood Ave	Buffalo, N. Y.
8 AVT	H.R.Kinney, 1808 Middlehurst Rd.,	Cleveland Heights, O.
8 AVU	J. L. Polliard, 302 American Ave	Butler, Pa.
8 AVV	J. W. Walter, 3201 W. 88th St	Cleveland, O.
8 AVW	G. L. Rhodes	St. Albans, W. Va.
8 AVX	H. C. Walborn, 827 Greyton Rd	Cleveland Heights, O.
8 AVY	K. Crouch, 76 Washington St	Carbondale, Pa.
8 AVZ	J. H. Terbrack, 3169 W. 90th St	Cleveland, O.
8 AWA	W. A. May, Jr., 5807 Solway St	Pittsburgh, Pa.
8 AWB	B. Stettinins	Lakemont, Mich.
8 AWC	W. Y. Sandison, 1181 N. Lockwood St.,	E. Cleveland, O.
8 AWD	F. Peters, Jr., 1825 Rosalind Ave	E. Cleveland, O.
8 AWE	A. B. Cozzens, 13306 Claiborne Ave	E. Cleveland, O.
8 AWF	E. M. Prentke, 10013 Somerset Ave	Cleveland, O.
8 AWG	M. Benskin, 1410 Fulton Rd. N. W.	Canton, O.
8 AWH	N. Heym, 2214 Barber Ave	Cleveland, O.
8 AWI	S. E. Shepard, 1207 Hall Ave	Lakewood, O.
8 AWJ	R. W. Wensko, 2146 W. 81st St	Cleveland, O.
8 AWK	J. Shugard, 11815 Miles Ave	Cleveland, O.
8 AWL	F. L. Lenc, 3606 Behwald St	Cleveland, O.
8 AWM	J. Kuenhold, 2733 Endicott Rd	Cleveland, O.
8 AWN	J. Bornwell, 131 Island Ave	Lansing, Mich.
8 AWO	M. Ballard, R.F.D. No. 1	Bedford, Mich.
8 AWP	S. Woodworth, 425 Brownell St	Syracuse, N. Y.
8 AWQ	F. T. Schell, Galloway & Pleasant Sts	Xenia, O.
8 AWR	F. Steele, 230 Georgia Ave	Lorain, O.
8 AWS	O. P. Schwartz, 115 Owasco St	Auburn, N. Y.
8 AWT	A. Eckhart, Jr., 1917 W. 65th St	Cleveland, O.
8 AWU	W. S. Heston, 127 Wilson Ave	Columbus, O.
8 AWV	W. A. McCormick, 566 N. Detroit Ave	Xenia, O.
8 AWW	R. Siemer, 97 Florida St	Buffala, N. Y.
8 AWX	V. D. Gettys	Hiran, O.
8 AWY	M. D. Van Horn, 233 Washington St	Geneva, N. Y.
8 AWZ	Rev. C. L. White, Main St	Stockdale, O.
8 AXA	W. L. Reece, 2311 Ravine St	Cincinnati, O.
8 AXB	A. Hubner, 1842 Westwood Ave	Cincinnati, O.
8 AXC	E. Manley, 328 4th St	Marietta, O.
8 AXD	F. H. Biever, 707 W. Water St	Smethport, Pa.
8 AXE	C. J. Collom, 1004 Smith St	Essexville, Mich.
8 AXF	E. Altman, 637 Bennett St	Findlay, O.
8 AXG	K. R. Greenwood, 12 Ericson Pl	Niagara Falls, N. Y.
8 AXH	L. H. Schramm, 216 W. Utica St	Buffalo, N. Y.
8 AXI	C. E. Howland, 1027 Madison St	Syracuse, N. Y.
8 AXJ	H. B. Sturgill, 362 Markensen St	Columbus, O.
8 AXK	F. Walker, 1626 Potter Pl	Cincinnati, O.
8 AXL	F. C. Beelman, Ottervein Home	Lebanon, O.
8 AXM	R. W. Dodd, Jr., 1858 Antietam St	Pittsburgh, Pa.
8 AXN	A. R. Dean	Brocton, N. Y.
8 AXO	H. E. Kohler, 1034 Whitesboro St	Utica, N. Y.
8 AXP	L. H. Reiner, 511 Miller Ave	Columbus, O.
8 AXQ	A. L. Voegele, 36 W. Main St	Lancaster, N. Y.
8 AXR	C. & J. Herrick, Aurora Rd	Twinsburg, O.
8 AXS	D. Gell, 2245 E. 103rd St	Cleveland, O.
8 AXT	W. T. Forcey, 422 Pine St	Curwensville, Pa.
8 AXU	R. A. Marshall	Cazenovia, N. Y.
8 AXV	J. I. Boyd, 1024 Maple Ave	Wilmerding, Pa.
8 AXW	E. E. Aker, Old Troy Pike	Phoneton, O.
8 AXX	C. Galbreath, 202 E. Main St	Union, N. Y.
8 AXY	H. B. Fawcett, 512 Cottage Ave	Fairmont, W. Va.
8 AXZ	E. P. Pearson, 515 St. Louis St	Toledo, O.
8 AYA	W. E. Cross, 2872 W. 12th St	Cleveland, O.
8 AYB	H. E. Frost, 249 Pine St	Buffalo, N. Y.
8 AYC	J. G. Goedel, 409 Norman Ave	Fonora, Pa.
8 AYD	J. P. Donaldson, Jr., 178 Sprague Ave	Bellevue, Pa.
8 AYE	L. G. Avery, 203 E. Grove St	Dunmore, Pa.
8 AYF	R. E. Hawring, 4836 Meldrum Ave	Detroit, Mich.
8 AYG	H. P. Stone, 184 W. Main St	Oberlin, O.
8 AYH	R. Leary, 15 Vernon Pl	Buffalo, N. Y
8 AYI	T. G. Brown, 428 State St	Traverse City, Mich.
8 AYJ	T.F.Whalen, Jr., Vernard College Pk.,	Clark Summit, Pa.
8 AYK	R. Durdam, R.F.D. No. 3	Stafford, N. Y.
8 AYL	E. Savage, 1447 Lincoln Ave	Lakewood, O.
8 AYM	R. W. Bissell & M. Nichols, 78 Newton St.,	Jamestown, N. Y.
8 AYN	R.F.Shima, 3396 E. Fairfax Ave	Cleveland Heights, O.
8 AYO	G. Broughton, 41 Nathan St	Ashtabula, O.
8 AYP	W. B. Butcher	Waynesfield, O.
8 AYQ	E. L. Heck & J. C. Clark	Shelby Heights, Shelby O.
8 AYR	W. S. Gruber, 506 Leah St	Utica, N. Y.
8 AYS	C. J. Scott, 1298 E. 142nd St	E. Cleveland, O.
8 AYT	H. V. Stevens, 63 Edson Ave	Buffalo, N. Y.
8 AYU	H. G. Gano, 3300 Elland Ave	Cincinnati, O.
8 AYV	W. Gallaway, 530 Fairchild St	Kent, O.
8 AYW	C. W. Vincent, 153 Connelsville St	Uniontown, Pa.
8 AYX	E. Tramains, 773 South St	Findlay, O.
8 AYY	R. S. Van Cleve, 14501 Strathmore Ave	Cleveland, O.
8 AYZ	G. Custer	Somerset, Pa.
8 AZA	R. J. Nichols, 2981 Manistique Ave	Detroit, Mich.
8 AZB	G. Lockner, 101 Louisa St	Utica, N. Y.
8 AZC	C. A. Johnson, 35 Miles St	Union City, Pa.
8 AZD	K. Bernard, 136 Abbott St	Detroit, Mich.
8 AZE	R. R. Chartener, 47 Allen St	Pittsburgh, Pa.
8 AZF	L. W. Parmater, 1813 S. Wash'ton Ave	Lansing, Mich.
8 AZG	G.R.White, 314 National Ave.N.W.	Grand Rapids, Mich.
8 AZH	H. C. Eldridge, Jr., 1024 Grand Ave	Dayton, O.
8 AZI	G. M. Heideger, Bridge St	W. Bridgewater, Pa.
8 AZJ	C. W. Payne, 189 N. Main St	Oberlin, O.
8 AZK	E. W. Zimmerman, 274 Baynes St	Buffalo, N. Y.
8 AZL	D. Wiard & K. Lambright, 169 5th St. N. W.,	Carrollton, O.
8 AZM	I. A. McCowan, 170 N. Gallatin Ave	Uniontown, Pa.
8 AZN	M. L. Miller, 16 W. Walnut St	Oxford, O.
8 AZO	C. F. Elser, 624 Brown Ave	Erie, Pa.
8 AZP	A. C. Boardman, 1560 Pratt St	Elmira, N. Y.
8 AZQ	H. A. Hiller, 139 Hanover St	Silver Creek, N. Y.
8 AZR	E Sawyer, 7741 Dexter Blvd	Detroit, Mich.
8 AZS	R. Walling, 35 Woodlawn Ave	Fairport, N. Y.
8 AZT	H. D. Stockel, 2015 Bailey Ave	Buffalo, N. Y.
8 AZU	S. Shapiro, 117 W. Court St	Warsaw, N. Y.
8 AZV	A. Martens, 4710 Bewick Ave	Detroit, Mich.
8 AZW	D. H. McKinley, State St	Curwensville, Pa.
8 AZX	A. M. Hustead, 33 Charles St	Uniontown, Pa.
8 AZY	O. W. McKenrick, W. Main St	Grampian, Pa.
8 AZZ	L. Fishbeck, 5416 24th St	Detroit, Mich.
8 BAA	P. Rice, Route No. 4, Box 77-A	New Phila., O.
8 BAB	B. Winters, 1905 Carson St	Pittsburgh, Pa.
8 BAC	H. P. Brown, Clinton St	Clark Mills, N. Y.
8 BAD	F. K. Trost, Walnut St	Tippecanoe City, O.
8 BAE	H. S. Cushman, 7 Riverview Ave	Binghamton, N. Y.
8 BAF	F. L. Ritterman, 215 Jackson St., N.S.	Pittsburgh, Pa.
8 BAG	F. H. Carroll, 2946 W. Liberty St	Pittsburgh, Pa.
8 BAH	H. Tummonds, 3200 Franklin Ave., West Y. M. C. A.,	Cleveland, O.
8 BAI	B. Mackelburg, 4730 Ellery Pl	Detroit, Mich.
8 BAJ	C. Roberts, 157 Park St	Buffalo, N. Y.
8 BAK	L. R. York, 4555 Hamilton Ave	Detroit, Mich.
8 BAL	R. G. Dean, 2 Alden Pl	Rochester, N. Y.
8 BAM	W. C. Reichard, 205 Bear St	Syracuse, N. Y.
8 BAN	W. J. Coesens, 6231 May Ave	Detroit, Mich.

8 BAO	W. E. Marshall	East Springfield, N. Y.
8 BAP	P. Smith, House of David	Benton Harbor, Mich.
8 BAQ	F. Reighard, 1502 Cambridge Rd	Ann Arbor, Mich.
8 BAR	C. W. Huff, 1760 Williams Ave	Norwood, O.
8 BAS	H. L. Gordon, East River St	Antwerp, O.
8 BAT	C. L. Cunningham, 955 S. Jackson St	Jackson, Mich.
8 BAU	S. Glaser, 13 Audubon St	Rochester, N. Y.
8 BAV	H. C. Thomas, 1226 Merrick Ave	Detroit, Mich.
8 BAW	R. Boetwick, 135 Broad St	Waverly, N. Y.
8 BAX	B. & G. Laboratories, 1025 Front St	Toledo, O.
8 BAY	D. P. Greene, 129 Lake St	Kent, O.
8 BAZ	R. E. Stealey, 947 Market St	Parkersburg, W. Va.

8 BBA	N. Stocker, 13022 Lake Shore Blvd	Cleveland, O.
8 BBB	H. C. Bingham, 14617 Lake Shore Blvd	Cleveland, O.
8 BBC	E. G. Enderle, 272 Franklin St	Columbus, O.
8 BBD	J. K. Marcus, 87 Kelly St	Rochester, N. Y.
8 BBE	C. E. Drakeley, 142 Main St	Penn Yan, N. Y.
8 BBF	K. W. Wall	Crampian, Pa.
8 BBG	W. C. Rhodes, Jr., 13401 Lake Shore Blvd.	Cleveland, O.
8 BBH	D. A. Young	New Straitsville, O.
8 BBI	E. R. Blodgett, 33 Canadaway St	Fredonia, N. Y.
8 BBJ	W. H. Gabert, 314 E. Pike St	Pontiac, Mich.
8 BBK	C. H. Fraser, 48 Glenwood Ave	Buffalo, N. Y.
8 BBL	M. L. Rivkin, 147 Wiona Ave	Highland Park, Mich.
8 BBM	H. N. Umbarger, 239 W. 5th St	Mansfield, O.
8 BBN	W. Gutting, 155 Wittemore St	Pontiac, Mich.
8 BBO	B. J. Trescott, 10 Pine St	Norwalk, O.
8 BBP	P. Crouch	Parma Heights, O.
8 BBQ	D. L. Jacobs, 396 Oakland Ave	Pontiac, Mich.
8 BBR	F. Dunn, 106 Geneva Ave	Highland Park, Mich.
8 BBS	A. L. Wahl, Pioneer & McNeilly St	Pittsburgh, Pa.
8 BBT	L. F. Long, 1704 E. 79th St	Cleveland, O.
8 BBU	R. P. Moler, 342 S. Ohio Ave	Columbus, O.
8 BBV	F. C. Gay, 1837 Idlewood Ave	Cleveland, O.
8 BBW	Radioelec. Shop, 1268 W. 115th St	Cleveland, O.
8 BBX	R. A. Kunkel, 1284 Westlake Ave	Lakewood, O.
8 BBY	A. C. Ellsworth, 2904 Warrington Rd	Cleveland, O.
8 BBZ	C. G. Howard, 183 S. Pine St	Newark, O.

8 BCA	J. E. Hausser, 3344 E. 128th St	Cleveland, O.
8 BCB	J. F. Wilhelm, 308 Louisa St	Williamsport, Pa.
8 BCC	P. R. Horton, 207 Elmwood Ave	Newark, O.
8 BCD	T. L. Kramer, 4232 Riverside Dr	West Park, O.
8 BCE	R. Gebhardt, 38 N. Pleasant St	Norwalk, O.
8 BCF	H. E. Hertz, Grove St	Sewickley, Pa.
8 BCG	R. E. Finley, 1199 Gladys Ave	Cleveland, O.
8 BCH	W. P. Strangward, 1642 Elmwood Ave	Lakewood, O.
8 BCI	D. Livingstone, Jr.	New Middletown, O.
8 BCJ	E. Christensen, 167 Walnut St	Ashtabula, O.
8 BCK	H. F. Holbeck, 135 W. 65th St	Cleveland, O.
8 BCL	G. A. Cathers, 1437 Eagle St	Franklin, Pa.
8 BCM	Cascadilla School, 116 Summit St	Ithaca, N. Y.
8 BCN	I. D. Taber, Y.M.C.A.	Cornwall-on-Hudson, N. Y.
8 BCO	D. A. Crossley, 1245 Manor Park	Cleveland, O.
8 BCP	W. E. Hamp, 502 6th St	Rochester, N. Y.
8 BCQ	M. B. Stacey, 826 Pine St	Port Huron, Mich.
8 BCR	E. Cassell, 45 Lincoln St	Grafton, W. Va.
8 BCS	S. D. Younger, 13513 Lake Shore Blvd	Cleveland, O.
8 BCT	C. M. Jackson, 135 Mill Creek Ave	Pittsville, Pa.
8 BCU	H. W. Jumisko, 2195 Leslie Ave	Detroit, Mich.
8 BCV	F. W. Russell, 931 Kensington Ave	Grand Rapids, Mich.
8 BCW	J. A. Fitch, 230 Spring St	Rome, N. Y.
8 BCX	H. C. Urschel, 23 N. Washington St	Delaware, O.
8 BCY	F. V. Broady, 447 Division Ave	Grand Rapids, Mich.
8 BCZ	G. F. Hall, 5135 Main Ave	Norwood, O.

8 BDA	E. Garrison, 515 10½ St	Parkersburg, W. Va.
8 BDB	J. J. Hill, 1572 Virginia St	Charleston, W. Va.
8 BDC	H. R. Maule, 924 Rawson Ave	Fremont, O.
8 BDD	D. E. Hinton, 329 N. 9th St	Cambridge, O.
8 BDE	A. R. Knight, 148 W. Winton St	Delaware, O.
8 BDF	M. H. Blair, R.F.D. No. 2	Wakeman, O.
8 BDG	F. Schweitzer, 5116 Ludlow Ave	St. Barnard, O.
8 BDH	M. H. Gambee, 97 Huntington Ave	Buffalo, N. Y.
8 BDI	T. McLean, 919 Eleanor Ave	Pittsburgh, Pa.
8 BDJ	H. L. Reddaway, 517 Woodland Ave	Toledo, O.
8 BDK	W. S. Gould, 2644 Ashton Rd	Cleveland Heights, O.
8 BDL	Saginaw High School (operator, T. C. Smith), 511 N. 10th St.	Saginaw, Mich.
8 BDM	L. F. Kridler, 402 Philadelphia Ave. E.	Detroit, Mich.
8 BDN	K. Smither, 90 Woodward Ave	Buffalo, N. Y.
8 BDO	H. C. Blackburn, 65 W. Miami Blvd	Dayton, O.
8 BDP	M. R. Garrod, 447 E. North Ave	East Palestine, O.
8 BDQ	R. A. Smith, 1030 Neptune Ave	Chester, W. Va.
8 BDR	De Loss Underwood, 113 Pine Grove Ave	Pontiac, Mich.
8 BDS	T. H. Murphy, 106 McKinley Ave	Endicott, N. Y.
8 BDT	C. Short, 1401 Seminole Ave	Detroit, Mich.
8 BDU	H. Lynn, 16 Oakland Ave	Uniontown, Pa.
8 BDV	J. Marsch, 1396 E. 53d St	Cleveland, O.
8 BDW	C. Rawa, 402 Winterhill St	Pittsburgh, Pa.
8 BDX	R. M. Nelson, 58 Penna. Ave	Binghamton, N. Y.
8 BDY	G. W. Fischer, 225 S. 4th St	Cuyahoga Falls, O.
8 BDZ	G. C. Covey, 14219 Potomac Ave	East Cleveland, O.

8 BEA	H. H. Newell, 516 Holmes St	Wilkinsburg, Pa.
8 BEB	R. S. Lapp, 72 Walcott St	Le Roy, N. Y.
8 BEC	L. F. Nelson, 407 Prospect St	Flint, Mich.
8 BED	J. Robertson, 206 Dewey St	Edgewood, Pa.
8 BEE	B. Brinker, St. Vincent Archabbey	Beatty, Pa.
8 BEF	F. D. Tidball, 10818 Churchill Ave	Cleveland, O.
8 BEG	K. A. Sylvester, 4523 Friendship Ave	Pittsburgh, Pa.
8 BEH	J. S. Wendell, 208 College St	Holly, Mich.
8 BEI	H. Hoover, 1168 Carlyon Rd	East Cleveland, O.
8 BEJ	E. N. Yeager, 522 Hackett Rd	Toledo, O.
8 BEK	H. J. Kuhlman, 148 Crescent Blvd	Dayton, O.
8 BEL	R. Ogden, 69 Carroll St	Binghamton, N. Y.
8 BEM	R. B. Ogden, 17 Summit St	Batavia, N. Y.
8 BEN	G. Katzenberger, 1121 W. Main St	Springfield, O.
8 BEO	N. S. Sherman, 418 Sherman St	Watertown, N. Y.
8 BEP	E. J. Allen, Jefferson & Arabella St	Defiance, O.
8 BEQ	C. D. English, 9 Bradley St	Binghamton, N. Y.
8 BER	R. E. Fithian, 200 E. Pine St	Grove City, Pa.
8 BES	C. E. Underhill, Jr., 538 Howell Ave	Cincinnati, O.
8 BET	E. E. Alden, 3466 Stickney Ave	Toledo, O.
8 BEU	S. H. Tuck, 6 Milton St	Tonawanda, N. Y.
8 BEV	D. S. Kimball, 5 Central Ave	Ithaca, N. Y.
8 BEW	H. M. Leffingwell, 1010 N. Pine St	Lansing, Mich.
8 BEX	W. A. Wright, 26 Bellevue Ave	Dayton, O.
8 BEY	C. H. Belknap, 729 E. 5th Ave	Columbus, O.
8 BEZ	P. A. Snell, 1 Highland Heights	Rochester, N. Y.

8 BFA	E. G. Penquet, 335 Adam St	Tonawanda, N. Y.
8 BFB	R. Wettengel, 8443 Curzon Ave	Cincinnati, O.
8 BFC	E. E. Straffon	New Baltimore, Mich.
8 BFD	A. C. Hostetler, 416 Williams Rd	Bellefontaine, O.
8 BFE	N. S. Odell, 25 Redfield Parkway	Batavia, N. Y.
8 BFF	Pontiac High School, corner W. Huron & State Sts.,	Pontiac, Mich.
8 BFG	F. M. Duff, 28½ Stair Ave	Detroit, Mich.
8 BFH	P. Beckberger, 149 Benedict St	Norwalk, O.
8 BFI	C. Anderson, R.F.D. No. 9	Mercer, Pa.
8 BFJ	J. E. Ross, 409 Cherry St	Clearfield, Pa.
8 BFK	A. R. Tuxill, 497 S. Paddock St	Pontiac, Mich.
8 BFL	H. S. Scott, 1857 Indianola Ave	Columbus, O.
8 BFM	C. J. Sonneberger, 919 Beardsley St	Akron, O.
8 BFN	R. G. Pearth, 837 Superior St	Toledo, O.
8 BFO	D. W. Drury, 1505 Diamond St	Toledo, O.
8 BFP	W. A. Havrane, R.F.D. No. 7	Pontiac, Mich.
8 BFQ	C. S. Shotwell, Jr., 1466 Victoria Ave	Lakewood, O.
8 BFR	F. A. Nelson, 15311 Waterloo Rd	Cleveland, O.
8 BFS	Lansing High School, 1112 E. Michigan Ave.,	Lansing, Mich.
8 BFT	H. M. Rodgers, 516 Highland Pl	Bellevue, Pa.
8 BFU	B. B. Kahn, 1731 Longfellow Ave	Detroit, Mich.
8 BFV	R. Mills, 133 Riverview Ave	Endicott, N. Y.
8 BFW	M. McKearney, 10608 Gooding Ave	Cleveland, O.
8 BFX	E. L. Horlacher, R.F.D. No. 8	Dayton, O.
8 BFY	L. B. Crossby, 4581 Lorain Ave	W. Park, O.
8 BFZ	C. C. Thoma, Jr., 78 N. Ave	Battle Creek, Mich.

8 BGA	S. J. Dowding, 57 Welts St	Mt. Clemens, Mich.
8 BGB	M. R. Davies, Jr., 3038 Chadbourne Rd	Cleveland, O.
8 BGC	J. W. Cramer, Jr., 103 Christiana St.,	N. Tonowanda, N. Y.
8 BGD	J. Lucas, 1917 E. 71st St	Cleveland, O.
8 BGE	M. J. Burrell, 200 Langley Ave	Pittsburgh, Pa.
8 BGF	B. Hyatt, 202 Rogers St	Mt. Vernon, O.
8 BGG	C. W. Smith, 301 S. Water St	Kent, O.
8 BGH	W. N. Small, 703 W. Cedar St	Kalamazoo, Mich.
8 BGI	A. H. Spaulding, 61 Massachusetts Ave.,	Battle Creek, Mich.
8 BGJ	A. L. Walser, Line St	Chesaning, Mich.
8 BGK	G. G. Brandle, 740 Bagley Ave	E. Grand Rapids, Mich.
8 BGL	W. A. Schaefer, 95 Highway St	Battle Creek, Mich.
8 BGM	M. M. Henderson, 1452 Comfort Ave	Lansing, Mich.
8 BGN	F. T. Palmer, 905 Cass St	Traverse City, Mich.
8 BGO	B. Knappen, 2021 Place Ave. SW.,	Grand Rapids, Mich.
8 BGP	V. E. Bolles	Stryker, O.
8 BGQ	H. A. Westervelt, 84 Nagold St	Grand Rapids, Mich.
8 BGR	G. E. Smith, 813 Davis St	Kalamazoo, Mich.
8 BGS	R. A. Lawson, 122 S. Bailey St	Cheboygan, Mich.
8 BGT	A. T. Ash, 600 3rd St	St. Clair, Mich.
8 BGU	J. H. Criss, 131 W. Main St	Newark, O.
8 BGV	L. E. Springer, 6 Woodruff Pl	Auburn, N. Y.
8 BGW	C. B. La Faber, Rathbone Addition	Marietta, O.
8 BGX	P. I. Dum, 303 Dakota Ave	Columbus, O.
8 BGY	H. R. Hayes, 34 Front St	Canajoharie, N. Y.
8 BGZ	D. Miquel, 609 S. Ray St	New Castle, Pa.

8 BHA	A. L. Albright, 180 W. Madison St	Rochester, N. Y.
8 BHB	P. T. Sherman, 209 E. High St	Defiance, O.
8 BHC	E. E. Baldwin	Lakemont, N. Y.
8 BHD	A. W. Strete	West Mansfield, O.
8 BHE	D. P. Wilson, 120 W. 5th St	Greenville, O.
8 BHF	R. B. Greenman, 144 West Ave	Fairport, N. Y.
8 BHG	F. Falkner, 13 Fruen St	Norwalk, O.
8 BHH	H. R. Derby, 124 S. Seward Ave	Auburn, N. Y.
8 BHI	B. O. Slocum, 397 Parkdale Ave	Buffalo, N. Y.
8 BHJ	K. L. Warren, 51 Carroll St	Binghamton, N. Y.
8 BHK	M. Carney, Jefferson St	Phoenix, N. Y.
8 BHL	O. V. Swisher, 114 Chicago St	Fairmont, W. Va.
8 BHM	F. U. Leitzinger, 6 5th St	Clearfield, Pa.
8 BHN	J. L. Masteller, 106 E. Burgess St	Mt. Vernon, O.
8 BHO	R. K. Bolenbaugh, 41 Fair Ave. W	Lancaster, O.
8 BHP	W. A. Staley, 120½ Main Ave	Sidney, O.
8 BHQ	R. S. Blaydon, 1300 Walnut St	Shamokin, Pa.
8 BHR	W. G. Klann, 2140 Scotten Ave	Detroit, Mich.
8 BHS	R. B. Oldham, E. North St	Sidney, O.
8 BHT	R. W. Besecker, 711 Wheeler Ave	Scranton, Pa.
8 BHU	K. Mitchell	Milan, O.
8 BHV	W. B. Rector, Brandenburg St	Bellington, W. Va.
8 BHW	R. R. Young	Gray, Pa.
8 BHX	J. D. Anderson, 306 Little Ave	Ridgway, Pa.
8 BHY	R. M. Todd, 607 W. Vine St	Mt. Vernon, O.
8 BHZ	F. M. Gehring, 614 Hamilton St	Toledo, O.

8 BIA	E. B. Hill	Deshler, O.
8 BIB	W. G. Baker, 81 S. Oakley Ave	Columbus, O.
8 BIC	G. M. Johnson, 1031 Juliana St	Parkersburg, W. Va.
8 BID	F. C. Lumney, 237 Masten St	Buffalo, N. Y.
8 BIE	W. Davidson, 407 Maple St	Marietta, O.
8 BIF	M. D. Baldwin, R.F.D. No. 3	Delaware, O.
8 BIG	K. A. Shepp, 54 Barney St	Wilkes-Barre, Pa.
8 BIH	K. Marvin, Elm St	Jefferson, O.
8 BII	W. A. Weiss, Jefferson St	Jefferson, O.
8 BIJ	J. Nader	Kellys Island, O.
8 BIK	C. C. Jones	Clayton, O.
8 BIL	G. S. Wickizer, Leonhart Bldg	Warren, Pa.
8 BIM	F. Hogue, 20 East St	Ashtabula, O.
8 BIN	E. J. Nicholson, 1407 First North St	Syracuse, N. Y.
8 BIO	A. R. Kindl, 61 Arnold Ave	Amsterdam, N. Y.
8 BIP	J. A. Potter, 213 Westminster Ave	Syracuse, N. Y.
8 BIQ	R. L. Traviss, 732 Wheeler Ave	Scranton, Pa.
8 BIR	E. S. Heiser, Jr., 323 Market St	Lewisburg, Pa.
8 BIS	A. D. Barkeloo, 280 S. Sandusky St	Delaware, O.
8 BIT	Lancaster High School (by F. H. Rutherfords),	Lancaster, O.
8 BIU	H. Matzinger, 3345 Blanchard St	Toledo, O.
8 BIV	C. C. Dengler, 44 University Ave	Delaware, O.
8 BIW	W. P. Liller, Davis St	Keyser, W. Va.
8 BIX	L. G. Hickson, E. Parkway, R.F.D	Rochester, N. Y.
8 BIY	L. J. Steiner, 1157 W. 28th St	Erie, Pa.
8 BIZ	L. E. Watkins, 373 N. Main St	Gloversville, N. Y.

8 BJA	A. Lancaster, 1882 W. 58th St	Cleveland, O.
8 BJB	Steel High School (by T. A. King), Main St.,	Dayton, O.
8 BJC	J. H. Norton, 2630 Hillger St	Detroit, Mich.
8 BJD	J. A. Campbell, 434 Brooklyn Ave., R. R. No. 14,	Dayton, O.
8 BJE	C. Pfleegor, 227 Mahoming St	Milton, Pa.
8 BJF	J. A. Marsh, 712 Atkinson Ave	Detroit, Mich.
8 BJG	F. Annetta, 427 Lehigh Ave	Palmerton, Pa.
8 BJH	J. Gluck	Kramesha, N. Y.
8 BJI	H. Wolter, 349 Fellows St	Syracuse, N. Y.
8 BJJ	The Elec. Const. & Motor Co., 529-531 S. Main St.,	Findlay, O.
8 BJK	Packard Elec. Co., Dana Ave	Warren, O.
8 BJL	The Trudeau Sanatorium	Saranac Lake, N. Y.
8 BJM	R. Schmidt & Co., 51 E. Main St	Rochester, N. Y.
8 BJN	L. A. Moranty, 3938 Livernois Ave	Detroit, Mich.
8 BJO	Radio Engineering Society, 431 6th Ave	Pittsburgh, Pa.
8 BJP	La Verne Gaul	Frankfort, Mich.
8 BJQ	T. A. Doddridge, 348 Florida St	Buffalo, N. Y.
8 BJR	R. Batt, 257 E. North St	Buffalo, N. Y.
8 BJS	W. F. Martin, 146 Maxwell Ave	Geneva, N. Y.
8 BJT	F. R. Shumway, 100 Brunswick St	Rochester, N. Y.
8 BJV	T. W. Scott, 120½ Chestnut St	Connellsville, Pa.
8 BJU	E. H. Roy, 295 Maple St	Buffalo, N. Y.
8 BJW	F. L. Platt, Main St	Marysville, Pa.
8 BJX	T. R. Polhemus, 3612 5th Ave	Beaver Falls, Pa.
8 BJY	R. Floyd, 507 Allison Ave	Washington, Pa.
8 BJZ	J. P. Rice, 151 W. High St	Waynesboro, Pa.

8 BKA	E. E. Avery, 201 E. Grove St	Dunmore, Pa.
8 BKB	R. H. Schneider, 207 W. Main St	Frankfort, N. Y.
8 BKC	Newmac Engineering Co., 9 E. Main St	Falconer, N. Y.
8 BKD	C. C. Wortman, 1222 Bridge St	Grand Rapids, Mich.
8 BKE	F. L. Brown, 509 6th Ave	Huntington, W. Va.
8 BKF	C. Curry, 1010 Tefft St	Parkerbsurg, W. Va.
8 BKG	A. D. Moorhead, 246 7th St	Indiana, Pa.
8 BKH	C. Theis, 942 3d Ave	New Kensington, Pa.
8 BKI	McK. Cottrell, 120 La Grange St	Morenci, Mich.
8 BKJ	F. L. Scott, Main St	Morristown, N. Y.
8 BKK	D. C. Wood, 441 W. Onondaga St	Syracuse, N. Y.
8 BKL	F. S. Green, 254 W. Elm St	Kent, O.
8 BKM	W. C. Gross, 453 Mill St	Conneaut, O.
8 BKN	R. W. Sears, 724 Beatty St	Cambridge, O.
8 BKO	J. C. Hopkins, 1349 Franklin Ave	Columbus, O.
8 BKP	F. W. Gallier, R.F.D.	Portage, O.
8 KBQ	G. N. Braun, R. R. No. 2	Wapakoneta, O.
8 BKR	R. Roess, Main St	Potsdam, N. Y.
8 BKS	C. C. Leader, Jr., 114 E. Church St	Shamokin, Pa.
8 BKT	H. L. Jantzen, 927 S. Ohio Ave	Columbus, O.
8 BKU	C. Janes, 424 Harrison St	Clarksburg, W. Va.
8 BKV	H. R. Marple, 129½ E. Michigan Ave.,	Lansing, Mich.
8 BKW	H. Bartel, 813 Hosmer St	Lansing, Mich.
8 BKX	C. A. Ramsey, 327 S. Oakland Ave	Sharon, Pa.
8 BKY	E. J. Wicke	Elsie, Mich.
8 BKZ	G. E. Munchauer, 27 Dodge St	Buffalo, N. Y.

8 BLA	H. F. Hopkins, Jr., 149 Earl St	Rochester, N. Y.
8 BLB	W. I. Atkinson, 95 Rutger St	Rochester, N. Y.
8 BLC	N. C. Bauman, 303 Peach St	Buffalo, N. Y.
8 BLD	J. M. Hill, 1346 Claremont Ave	Buffalo, N. Y.
8 BLE	M. S. Tritchler, 17 Verplanck St	Buffalo, N. Y.
8 BLF	F. J. Gerber, 399 S. Delavan Ave	Detroit, Mich.
8 BLG	W. C. Ellis, 160 Laurel St	Buffalo, N. Y.
8 BLH	A. F. Busch, 24 Parker St	Buffalo, N. Y.
8 BLI	P. Will, Jr., 7 Highland Heights	Rochester, N. Y.
8 BLJ	B. V. K. French, 1045 Michigan Ave	Buffalo, N. Y.
8 BLK	F. B. Reid, 388 S. Grand Blvd	Detroit, Mich.
8 BLL	H. C. Dunham, 147 Grand Ave	Mt. Clemens, Mich.
8 BLM	F. H. Roush, 575 Alger Ave	Detroit, Mich
8 BLN	A. F. Drda, 1186 E. 71st St	Cleveland, O
8 BLO	A. Ringler, 60 Marshall St	Rochester, N. Y.
8 BLP	F. Roetzer, 90 Locust St	Buffalo, N. Y.
8 BLQ	H. Winter, R.F.D. No. 2	New Straitsville, O.
8 BLR	E. Smith, 306 Lansing St	Utica, N. Y.
8 BLS	F. V. Branch, 74 Front St	Binghamton, N. Y.
8 BLT	G. Ransom, 17 Hobson Pl	Bradford, Pa.
8 BLU	H. J. Loftis, 144 Lane Ave	Columbus, O.
8 BLV	R. E. Pattington	Scipioville, N. Y.
8 BLW	C. E. Homes, 310 W. Broen St	Grand Rapids, Mich.
8 BLX	K. E. Davis, 75 Maple St	Potsdam, N. Y.
8 BLY	M. G. Pattington, R.F.D. No. 29	Ledyard, N. Y.
8 BLZ	H. W. Baukat, 413 E. Main St	Batavia, N. Y.

8 BMA	C. E. Brickwood, 305 5th Ave	Frankfort, N. Y.
8 BMB	F. M. Sarver, 2842 Stanton Ave	Cincinnati, O.
8 BMC	J. H. Howe, 331 Market St	Clearfield, Pa.
8 BMD	S. M. Boddington, Gardner Rd	Elmhurst, Pa.
8 BME	C. Middletown, Findlay St	Portage, O.
8 BMF	E. H. Wilson, 606 E. University St	Wooster, O.
8 BMG	D. R. McCollister, 209 Hamilton St	Bellevue, O.
8 BMH	M. B. Stephenson, 410 Castalia St	Bellevue, O
8 BMI	G. W. Curtiss, 830 W. Main St	Ravenna, O.
8 BMJ	P. F. Woodward, 237 E. Main St	Kent, O.
8 BMK	W. A. Maufrass, R.F.D. No. 6	Kent, O.
8 BML	C. J. Murray, 233 Ridge Ave	Curwensville, Pa.
8 BMM	J. A. Cameron, 134 N. Barry St	Olean, N. Y.
8 BMN	K. B. McAlpin, 61 Parkwood Ave	Kenmore, N. Y.
8 BMO	W. J. Kinnan, 32 North Ave	Canandaigua, N. Y.
8 BMP	J. M. Alter, 325 Lincoln St	Johnstown, Pa.
8 BMQ	R. B. Fairchild	Portville, N. Y.
8 BMR	R. A. Andreas, 419 N. Broadway St	New Phila., O.
8 BMS	S. C. Dart, 72 Whitfield St	Pontiac, Mich.
8 BMT	D. King, Marlett Bldg	Marlett, O.
8 BMU	M. G. Barrick	Arden, W. Va.
8 BMV	W. B. Hanlon, 5818 Rippey St	Pittsburgh, Pa.
8 BMW	J. S. Hunter, 807 Crawford St	Duquesne, Pa.
8 BMX	C. B. Davis, 21 N. Pine St	Buffalo, N. Y.
8 BMY	R. F. Fandree, 325 3d St	Chester, W. Va.
8 BMZ	Y. M. Hoag, Cooper St	Vernon, N. Y.

8 BNA	A. P. Parker, 103 N. Main St	London, O.
8 BNB	A. J. Cook, 8 Phinn Ave	Binghamton, N. Y.
8 BNC	O. B. Slocum, R.F.D. No. 4, Box 4, State Rd.,	Ionia, Mich.
8 BND	E. R. Van Arsdale, 119 Giles St	Ithaca, N. Y.
8 BNE	Detroit Police Dept., 920 Farmer St	Detroit, Mich.
8 BNF	C. S. Maynard, 128 South St	Chardon, O.
8 BNG	E. H. Clark, 426 Sumat St	Toledo, O.
8 BNH	W. E. Slabough, Jr., 142 S. Union St	Akron, O.
8 BNI	Cass Tech. High School, Grand River & 2d.,	Detroit, Mich.
8 BNJ	W. Block, 6256 Rohns Ave	Detroit, Mich.
8 BNK	T. G. Colvin, 220 Southern Ave	Cincinnati, O.
8 BNL	L. M. Hill, 1313 E. 112th St	Cleveland, O.
8 BNM	P. Loomis, 2452 Glenwood Ave	Toledo, O.
8 BNN	R. Koptish, 14740 Athens Ave	Lakewood, O.
8 BNO	T. A. Hendricks, 2941 Somerton St.,	Cleveland Heights, O.
8 BNP	S. Lichblaw, 8914 Buckeye Rd	Cleveland, O.
8 BNQ	E. Dempsey, 429 Stoddart Ave	Columbus, O.
8 BNR	A. Tucker, 4732 Franklin Ave	Norwood, O.
8 BNS	J. L. Wasson, 634 Third Ave	Beaver Falls, Pa.
8 BNT	C. E. Sickel, 1540 Arch St	Pittsburgh, Pa.
8 BNU	R. Campbell	Derby, N. Y.
8 BNV	J. J. Kotecki, 149 W. Park St	Toledo, O.

8 BNW	J. G. Hoop, 413 11th St	Beaver Falls, Pa.
8 BNX	E. J. Schultz, 1311 Colburn St	Toledo, O.
8 BNY	R. H. Winchester, 659 Allen St	Syracuse, N. Y.
8 BNZ	L. A. Price, 386 Euclid Ave	Akron, O.
8 BOA	E. M. Little, 21 Clayton Ave	Cortland, N. Y.
8 BOB	W. Hatch, Jr., 112 N. Washington St	Ypsilanti, Mich.
8 BOC	C. H. Whitaker, 181 S. 4th St	Cuyahoga Falls, O.
8 BOD	D. S. Jennings, 131 Jefferson Ave	Rochester, N. Y.
8 BOE	R. C. Fosberg, 23 Alton Pl	Jamestown, N. Y.
8 BOF	G. D. Newton, 743 Glenn Ave	Wilkinsburg, Pa.
8 BOG	J. H. Ebert, 305 W. State St	Springfield, O.
8 BOH	J. Maesk, 17 Boston St	Rochester, N. Y.
8 BOI	A. E. Kaul, 4227 Muriel Ave	Cleveland, O.
8 BOJ	T. J. George, 3582 Outlook Ave	Cincinnati, O.
8 BOK	E. J. Govern, 25 Vicks Park B	Rochester, N. Y.
8 BOL	L. W. Makley, 140 Franklin St	Dayton, O.
8 BOM	P. Levison, 11512 Ohlman Ave	Cleveland, O.
8 BON	C. M. Bartter, 14530 Lorain Ave	West Park, O.
8 BOO	D. Henderson, 14619 Lorain Ave	West Park, O.
8 BOP	A. McBurney, 1396 E. 115th St	Cleveland, O.
8 BOQ	G. Fagerholm, 2128 W. 105th St	Cleveland, O.
8 BOR	W. C. Dean, 400 E. Erie St	Albion, Mich.
8 BOS	R. C. Corderman, 406 E. End Ave	Pittsburgh, Pa.
8 BOT	M. Peere, R.F.D. No. 1	Wilmington, O.
8 BOU	H. L. Mueller, High St., Box 115	Springdale, Pa.
8 BOV	G. A. Euwer	Unity, Pa.
8 BOW	M. Reed, N. East St	Crestline, O.
8 BOX	H. B. Rohrer, N. 2nd St	Tippecanoe City, O.
8 BOY	C. P. Earle, 338 Ellsworth Ave	Sharon, O.
8 BOZ	J. M. Moran, 408 Adams St. E	Sandusky, O.
8 BPA	S. B. Robinson, 334 11th St	Toledo, O.
8 BPB	M. M. Hancock, 3 Centenary St	Binghamton, N. Y.
8 BPD	M. D. Bryan, 2d & Broad Sts	Middletown, O.
8 BPE	A. Noaker, 140 Liberty St	Bowling Green, O.
8 BPF	M. Joseph, Box 35, R.F.D. No. 1	Toledo, O.
8 BPG	A. Moore	Portland, Mich.
8 BPH	W. A. Gavenas, 866 Main St	Edwardsville, Pa.
8 BPI	A. Kappes, 734 Bowlby St	Waynesburg, Pa.
8 BPJ	W. H. Marshall, 7301 McClure Ave	Swissvale, Pa.
8 BPK	C. A. Grissinger, 187 Hollywood St	Youngstown, O.
8 BPL	S. J. Hutchinson, 852 Rebecca Ave	Wilkinsburg, Pa.
8 BPM	J. R. Hazlett, 1020 Washington Ave., cor. 4th St. & 4th Ave. (school)	Monaca, Pa.
8 BPN	P. Learn, 76 Slocum St	Ft. Forty, Pa.
8 BPO	F. G. Kear, Jr., 403 Front St	Minersville, Pa.
8 BPP	V. J. Andrew, 720 Spruce St	Wooster, O.
8 BPQ	W. Mason, 910 Emerson St	Fairmont, W. Va.
8 BPR	G. E. & R. A. Jenson, Lake Michigan Park	Muskegon, Mich.
8 BPS	E. D. Hughes, 54 Custer St	Wilkes-Barre, Pa.
8 BPT	C. E. Leedy, R.F.D. No. 3	Monroe, Mich.
8 BPU	G. R. Beerbower, 1109 Alesander St	Fairmont, W. Va.
8 BPV	E. R. Holes, 1210 Ottawa St. W	Lansing, Mich.
8 BPW	C. W. Flesher, Elk St	Gassaway, W. Va.
8 BPX	R. A. Jakubovsky, 6 Beach St	Muskegon, Mich.
8 BPY	C. M. Schindel, 904 Franklin St	Wilkinsburg, Pa.
8 BPZ	H. L. Lockwood, 14 Clinton St	Tonowanda, N. Y.
8 BQA	A. Nygren, 116 Bowen St	Jamestown, N. Y.
8 BQB	F. Kieshauer, 242 Buffalo St	Jamestown, N. Y.
8 BQC	J. L. Miller, 31 Marshall St	Norwalk, O.
8 BQD	M. Mackey, R.F.D. No. 5	Warren, O.
8 BQE	D. H. Ammon, 525 Green Ridge St	Scranton, Pa.
8 BQF	R. H. Mercer, 539 Broad St	Ashland, O.
8 BQG	N.S.Forman, 48 University Driveway	Morgantown, W. Va.
8 BQH	A. O. Van Evera, 32 Montgomery St.	Canajoharie, N. Y.
8 BQI	N. C. McCombs, R.F.D. No. 5	Warren, O.
8 BQJ	E. Miller, Second St	Espy, Pa.
8 BQK	S. F. Meek, Washington Blvd.	New Baltimore, Md.
8 BQL	C. S. Taylor, 598 Meston St	Buffalo, N. Y.
8 BQM	H. K. McClung, 5615 Howe St	Pittsburgh, Pa.
8 BQN	W. J. Thomson, 5965 Vermont Ave	Detroit, Mich.
8 BQO	F. L. Grant, Ben Avon Heights	Pittsburgh, Pa.
8 BQP	J. A. Thompson, 506 Tingley Ave	Bellevue, Pa.
8 BQQ	N. W. Bell, 424 Taylor Ave., N. S.	Pittsburgh, Pa.
8 BQR	F. L. Elliott, 3831 Grand River Ave	Detroit, Mich.
8 BQS	Dongan Elec. Mfg. Co., 2987 Franklin St.	Detroit, Mich.
8 BQT	F. M. Underwood, 805 Main St	Monongahela, Pa.
8 BQU	R. H. McCague, Pine Rd	Sewickley, Pa.
8 BQV	M. G. Pawley, 102 West Ave	Ithaca, N. Y.
8 BQW	P. R. Treslar, 80 Dilby St	Forty Fort, Pa.
8 BQX	W. G. McKenzie, 3712 Mifflin St	Pittsburgh, Pa.
8 BQY	J. H. McTighe, 133 Chapin St	Binghamton, N. Y.
8 BQZ	E. T. Sauer, 100 N. Wilkenson St	Dayton, O.
8 BRA	R. M. Moore, 208 Harvard Pl	Syracuse, N. Y.
8 BRB	F. K. Rankin, Chillecothe St	S. Charleston, O.
8 BRC	H. S. Myers	Van, Pa.
8 BRD	T. J. Bastar, Jr., 1913 Termon Ave., N. S.	Pittsburgh, Pa.
8 BRE	A. H. Gates, Box 132	Lewisburg, Pa.
8 BRF	E. T. Alcox, 1323 W. 31st St	Erie, Pa.
8 BRG	D. S. Brock, E. Green St	Waynesburg, Pa.
8 BRH	W. E. Nichols, 405 S. Union St	Galion, O.
8 BRI	T. M. Dickinson, 217 W. Embargo St	Rome, N. Y.
8 BRJ	J. F. Petlock, 302 Goodyear Ave	Buffalo, N. Y.
8 BRK	D. A. Clarke, 70 St. James Pl	Buffalo, N. Y.
8 BRL	H. W. Haberl, 35 Haldane Ave	Crafton, Pa.
8 BRM	M. W. Crichton, 88 Murray Ave	Uniontown, Pa.
8 BRN	S. W. Beyland, Lond Meadow Circle	Pittsford, N. Y.
8 BRO	E. J. Weis, 778 Lansing St	Utica, N. Y.
8 BRP	F. R. Oberle, 891 Stanton Ave	Millvale, Pa.
8 BRQ	K. L. Brown, 719½ Grand River	Port Huron, Mich.
8 BRR	W. Waterman, 627 Ford St	Ogdensburg, N. Y.
8 BRS	H. Hartman, 48 Butternut St	Lyons, N. Y.
8 BRT	H. M. Henricks, c/o Y.M.C.A.	New Kensington, Pa.
8 BRU	A. M. Schaefer, 879 Stanton Ave	Millvale, Pa.
8 BRV	C. L. Volyers	Handley, W. Va.
8 BRW	C. A. Port, 320 Jefferson St	Connellsville, Pa.
8 BRX	J. F. Euler, 326 Mellon St	Pittsburgh, Pa.
8 BRY	F. D. Gamble, 946 Islington St	Toledo, O.
8 BRZ	J. L. Russell, 2271 S. Overlook Rd	Cleveland, O.
8 BSA	P. Fletcher, 215 S. Main St	Paulding, O.
8 BSB	S. H. Gibson, 345 Beard Ave	Buffalo, N. Y.
8 BSC	O. A. Sibley, Oak Hill	Grove City, Pa.
8 BSD	E. R. Mosher, 7 Arena St	Binghamton, N. Y.
8 BSE	T. L. Hogue, Lincoln Way	Lisbon, O.
8 BSF	R. A. Trago, 27 15th St	Buffalo, N. Y.
8 BSG	V. M. Graham, 157 Augustine St	Rochester, N. Y.
8 BSH	J. C. Matheny, 5120 Globe Ave	Norwood, O.
8 BSI	B. Webster, 424 Mad River St	Bellefontaine, O.
8 BSJ	C. A. Neth, 102 E. Fayette St	Connellsville, Pa.
8 BSK	W. T. Cooke, 242 Forest St	Oberlin, O.
8 BSL	F. A. Long, 248 Washington St	Grand Rapids, Mich.
8 BSM	C. C. Forester, 781 Northampton St	Buffalo, N. Y.
8 BSN	F. L. Huntwork, 92 Murphy Ave	Pontiac, Mich.
8 BSO	E. T. Barton, Genesee St	Montour Falls, N. Y.
8 BSP	Beaver Falls High School, 1706 7th Ave.,	Beaver Falls, Pa.
8 BSQ	J. D. Yount, R.F.D. No. 4	Dayton, O.
8 BSR	W. U. Sines, 1509 E. Washington St	New Castle, Pa.
8 BSS	J. E. Page, 5 Charlotte St	Baldwinsville, N. Y.
8 BST	C. P. Trimmer, 16 Jackson Rd	Idlewood, Pa.
8 BSU	J. R. Normile, 152 Oak St	Binghamton, N. Y.
8 BSV	W. L. DuBois, 208 Avis St	Rochester, N. Y.
8 BSW	W. J. Rust	Elberta, Mich.
8 BSX	H. C. Hopkins, 5 South St	Auburn, N. Y.
8 BSY	E. W. Weimer, 42 Poplar Ave	Wheeling, W. Va.
8 BSZ	L. L. Bailey, Starkey Seminary	Lakemont, N. Y.
8 BTA	C. F. Conbar, 233 S. Starr Ave	Bellevue, Pa.
8 BTB	R. Haycock, 1 Circuit Drive	Binghamton, N. Y.
8 BTC	R. Durm, 101 St. Joseph Ave	Niles, Mich.
8 BTD	D. McDaniel, 219 Grant Ave	Moundsville, W. Va.
8 BTE	W. L. Mays	Alderson, W. Va.
8 BTF	T. Anderson, 65 W. Ridge Ave	Crafton, Pa.
8 BTG	W. W. Hall, 716 Center Ave	Avalon, Pa.
8 BTH	R. H. Davis, W. N. Broadway	Columbus, O.
8 BTI	P. Bayer, 292 N. Liberty St	Delaware, O.
8 BTJ	M. L. Johnson, 326 Pearl St	Leipsic, O.
8 BTK	E. A. Link, Jr., 183 Water St	Binghamton, N. Y.
8 BTL	A. C. Labz, 207 Prospect St	S. Haven, Mich.
8 BTM	W.L.Gano, cor. Main & Catherine Sts.	Montour Falls, N. Y.
8 BTN	G. G. Granger, 113 Lahoma St	Lansing, Mich.
8 BTO	A. L. Kent, 199 Court St	Binghamton, N. Y.
8 BTP	United Elec. Stores Co., 721 Braddock Av.	Braddock, Pa.
8 BTQ	F. B. Phillips, 827 Kirkpatrick Ave	N. Braddock, Pa.
8 BTR	R. Murray, 25 Smothers Ave	Uniontown, Pa.
8 BTS	Wilmerding, Y.M.C.A., 200 Marguerite St.,	Wilmerding, Pa.
8 BTT	G. B. Oppy, Main St	So. Charleston, O.
8 BTU	F. G. Erbe, 153 Seneca Parkway	Rochester, N. Y.
8 BTV	R. H. Koehler, 424 Stokes Ave	Braddock, Pa.
8 BTW	B. F. Cutting	Cohoctah, Mich.
8 BTX	O. D. Baldwin, 410 S. Collingwood Ave	Eastwood, N. Y.
8 BTY	L. W. Edson, 86 Wolcott St	LeRoy, N. Y.
8 BTZ	G. P. Martin, 152 Columbia St	Newark, O.
8 BUA	J. J. Raby, 921 Vine St	Lansing, Mich.
8 BUC	H. W. Barner, 840 Wilson St	South Haven, Mich.
8 BUD	L. L. Irvin, 18 Kinsey Ave	Kenmore, N. Y.
8 BUE	H. B. Yager, 122 S. Jersey St	Dayton, O.
8 BUF	J. H. Wilson, 479 Miller Ave	Columbus, O.
8 BUG	J. S. Scott, 517 Maxwell Ave	Steubenville, O.
8 BUH	R. Hardy	Whittaker, Mich.
8 BUI	J. E. Dayger, R.F.D. No. 1	Binghamton, N. Y.
8 BUJ	H. K. Spencer, 160 Conklin Ave	Binghamton, N. Y.
8 BUK	H. J. Bannon, 486 E. 108th St	Cleveland, O.
8 BUL	J. E. Law, Jr., 36 Jones Ave	Morgantown, W. Va.
8 BUM	A. R. Marcy, 113 W. Ranyor Ave	Syracuse, N. Y.
8 BUN	W. M. Jennings, 37 Main St	Oil City, Pa.
8 BUO	R. S. Baker, 41 Steele Ave	Gloversville, N. Y.
8 BUP	T. J. Moyer, 1619 22d Ave	Toledo, O.
8 BUQ	A. G. Ferriss, 73 Warren Ave	Utica, N. Y.
8 BUR	C. H. Pedley, 530 Otter St., Box 393	Franklin, Pa.
8 BUS	H. D. Morarity, 2134 Brookwood Ave	Toledo, O.
8 BUT	E. E. Noble, Pearl St	S. Brownsville, Pa.
8 BUU	M. Brown, 828 Potomac Ave	Buffalo, N. Y.
8 BUV	C. F. Curran, 10 Burr Ave	Binghamton, N. Y.
8 BUW	S. E. Dolph, 732 N. Webster Ave	Scranton, Pa.
8 BUX	R. B. Andrews, 329 4th St	Olean, N. Y.
8 BUY	Hughes High School, Clifton & McMillan Sts.,	Cincinnati, O.
8 BUZ	C. F. Woese, 802 McBride St	Syracuse, N. Y.
8 BVA	P. Schwartz, 218 Grant St	Washington, Pa.
8 BVB	H. A. Gates, 2905 Observatory Ave	Cincinnati, O.
8 BVC	H. Monto, 639 Oswald St	Toledo, O.
8 BVD	V. W. Busch	Keego Harbor, Mich.
8 BVE	A. S. Prescott, 205 Clarke St	Syracuse, N. Y.
8 BVF	G. M. Clasper, 121 S. 7th St	Connellsville, Pa.
8 BVG	H. L. Ganster, 215 Valley St	Marysville, Pa.
8 BVH	N. H. Poole, 1438 Hillcrest Ave	Toledo, O.
8 BVI	J. Russell Thorburn, R.F.D. No. 3	Mason, Mich.
8 BVJ	Pittsburgh Radio Appliance Co., 112 Diamond St.,	Pittsburgh, Pa.
8 BVK	R. P. Ranney, 3016 Chadbourne Rd	Cleveland, O.
8 BVL	F. Stelmeyer, 47 22d St. N.	Kenmore, O.
8 BVM	E. A. Bullock, 60 Eason Ave	Highland Park, Mich.
8 BVN	G. E. Mears, 2940 E. Grand Blvd	Detroit, Mich.
8 BVO	F. L. Barr, State & Arch Sts	Fremont, O.
8 BVP	O. Pliets, Jr., 2803 Riverside Ave	Cleveland, O.
8 BVQ	R. E. Snyder, 254 Cable Pl	Akron, O.
8 BVR	J. E. Phillips, 9711 Lamount Ave	Cleveland, O.
8 BVS	H. H. Brindley, 118 W. Main St	Clarksburg, W. Va.
8 BVT	B. H. Baskin, 12109 Mt. Overlook	Cleveland, O.
8 BVU	A. Bartlebaugh, 1310 Superior St	Toledo, O.
8 BVV	M. Nolan	Provemont, Mich.
8 BVW	E. L. Johnson, 1628 Brinkerhoff Ave	Utica, N. Y.
8 BVX	R. Richholt	Holgate, O.
8 BVY	M. Hogue, 389 Wabash Ave	Akron, O.
8 BVZ	N. H. Hiller, Jr., 68 Laurel St	Carbondale, Pa.
8 BWA	W. F. Warden, Jr., 467 Merriman Rd	Akron, O.
8 BWB	G. H. Lister, 9737 Woodward St	Cleveland, O.
8 BWC	R. E. Clarke, 42 W. Main St	Fredonia, N. Y.
8 BWD	H. Rogers, 16 Halliday St	Oil City, Pa.
8 BWE	F. W. Koster, 700 Vinton St	Toledo, O.
8 BWF	J. C. Gerber, 621 Division St	Cincinnati, O.
8 BWG	S. M. Dotterer, 127 Poplar St	Leipsic, O.
8 BWH	A. Quick, 316 Green St	Syracuse, N. Y.
8 BWI	G. Amolsch, 3630 W. 47th Pl	Cleveland, O.
8 BWJ	Flint High School (by F. D. Fallain), Beach St.,	Flint, Mich.
8 BWK	W. F. Bonnell, 1876 E. 73d St	Cleveland, O.
8 BWL	A. C. Dodds, 3400 S. Salina St	Syracuse, N. Y.
8BWM	W. Mosier	Provemont, Mich.
8 BWN	R. L. Dyer, 813 Locust St	Toledo, O.
8 BWO	H. S. Curry, 330 13th St	Scranton, Pa.
8 BWP	T. D. Taylor, 223 N. 3d St	Olean, N. Y.
8 BWR	I. D. Bell, R.F.D. No. 4, Box 52	Battle Creek, Mich.
8 BWS	F. Davenport, 44 Byron St	Battle Creek, Mich.
8 BWT	W. S. O'Brien, 146 Rockland Ave	Syracuse, N. Y.
8 BWU	C. L. Chaffee, 201 W. Perry St	Paulding, O.
8 BWV	Petroleum Tel. Co., 1 Sycamore St	Oil City, Pa.
8 BWW	C. Bohanengel, 420 Irving St	Toledo, O.
8 BWX	P. H. Hoffman, 1500 7th Ave	Beaver Falls, Pa.
8 BWY	E. W. Reeve, 1529 Broadway	Ann Arbor, Mich.
8 BWZ	H. J. Partridge, 135 Broadway	Dover, O.
8 BXA	E. W. Esslinger, 123 Chapin St	Ann Arbor, Mich.
8 BXB	H. T. Edwards, Jr., 152 Purdy St	Buffalo, N. Y.
8 BXC	M. Fruehauf, 17702 Detroit Ave	Lakewood, O.
8 BXD	W. D. Ellsworth, 506 Vine St	Clyde, O.
8 BXE	A. J. Zugel, 219 Pennsylvania Ave	S. Renova, Pa.
8 BXF	A. H. Dickinson, 2 Front St	Binghamton, N. Y.
8 BXG	H. B. Young, 26 Forest Pl	Fredonia, N. Y.
8 BXH	H. C. Hedges, 35 12th Ave	Columbus, O.
8 BXI	T. S. Batson, 703 Park Ave	Utica, N. Y.
8 BXJ	M. A. Mead, High St	Savannah, N. Y.
8 BXK	M. E. McGraw, 1120 5th Ave	Beaver Falls, Pa.
8 BXL	K. J. Dunlap, 104 W. Pleasant Ave	Syracuse, N. Y.
8 BXM	G. E. Irvin, 2118 Hillman St	Youngstown, O.
8 BXN	R. G. McClure, Williams Ave	Williamston, W. Va.
8 BXO	W. L. Zimmerman, Goodrich St. Sta	Akron, O.
8 BXP	D. A. Grant, 33 Montgomery St	Canajoharie, N. Y.
8 BXQ	F. A. McPhillips, 562 Palmwood Ave	Toledo, O.
8 BXR	J. P. Castenholz, Box 25	Muskegon, Mich.
8 BXS	S. Workman, Jr., 731 E. Maiden St	Washington, Pa.
8 BXT	L. L. Fuller, 81 W. Main St	Williamson, N. Y.
8 BXU	W. O. Wickes, 131 Clarke St	Syracuse, N. Y.
8 BXV	D. E. Church, 142 Paul Ave	Syracuse, N. Y.
8 BXW	F. G. Rohm, 20 Bennett St	Williamsport, Pa.
8 BXX	H. Forschner, 7 Ford St	Norwalk, O.
8 BXY	R. B. Parsons	Old Forge, N. Y.
8 BXZ	C. Finical, 213 Wilson Ave	Galion, O.
8 BYA	W. B. Rupp, 51 N. 3d St	Lewisburg, Pa.
8 BYB	H. A. Scullen, 50 S. 10th St	Kenmore, O.
8 BYC	C. R. Hart, Ohio St	Antwerp, O.
8 BYD	L. Grabensteder, 2767 Observatory Rd	Cincinnati, O.
8 BYE	G. M. Withington, Jr., 316 5th St	Marietta, O.
8 BYF	W. E. Schele, 89 Highway St	Battle Creek, Mich.
8 BYG	H. A. Waters, R.F.D. No. 3	Ridgeway, N. Y.
8 BYH	F. M. Gager, 1430 College St	Wilkes-Barre, Pa.
8 BYI	N. L. Straub, 724 Bedford St	Johnstown, Pa.
8 BYJ	G. H. Taber, 4114 Grand Blvd	Pittsburgh, Pa.
8 BYK	A. Oschmann, Jr., 2105 Prospect Ave	Scranton, Pa.
8 BYL	L. Stineman, 4871 Maplewood Ave	Detroit, Mich.
8 BYM	A. W. Kovatch, 1474 Warren Rd	Lakewood, O.
8 BYN	I. G. Davis, 1034 Devonshire Rd	Grosse Pointe, Mich.
8 BYO	R. M. Turrell, 506 Broadway St	Harrison, O.
8 BYP	D. Mustari, 766 19th St	Niagara Falls, N. Y.
8 BYQ	LeMar Morey, 447 Rich St	Ionia, Mich.
8 BYR	C. W. Davis, 703 Park St	Grand Ledge, Mich.
8 BYS	L. J. Kovalik, 322 Hunter Ave	Niles, O.
8 BYT	C. C. May, 525 Fletcher St	Owosso, Mich.
8 BYU	H. Wilcox	Lakemont, N. Y.
8 BYV	Elec. Spec. Co., 48-50 S. Front St	Columbus, O.
8 BYW	W. R. Neisser, Bucknell University	Lewisburg, Pa.
8 BYX	A. C. Penfield, 528 5th St	Struthers, O.
8 BYY	F. Lankton, 835 Dayton St	Lansing, Mich.
8 BYZ	H. Schoenfelder, 513 Boone St	Pottsville, Pa.
8 BZA	M. Clarke, Ridge Rd	Greece, N. Y.
8 BYO	R. M. Turrell, 506 Broadway	Harrison, O.
8 BZC	R. R. Palmer, 920 Shiawassee St	Lansing, Mich.
8 BZD	C. A. Moline, 227 Poplar St	Wyandotte, Mich.
8 BZE	A. Whitley, 1605 Chicago Blvd	Detroit, Mich.
8 BZF	R. M. Lacey, 1998 Euclid Ave	Detroit, Mich.
8 BZG	Buffalo Police Dept., Niagara & Franklin Sts.,	Buffalo, N. Y.
8 BZH	P. A. Noxon, 310 Stadium Pl	Syracuse, N. Y.
8 BZI	E. H. Vedder	Whittaker, Mich.
8 BZJ	L. A. Morrow, 1231 E. High St	Springfield, O.
8 BZK	J. T. Meyer, 668 Woodlawn Ave	Buffalo, N. Y.
8 BZL	W. Gallaway, 530 Fairchild Ave	Kent, O.
8 BZM	K. A. Helman, 2437 E. 82d St	Cleveland, O.
8 BZN	W. C. Harper, Van Buren Rd. R. 1	Dunkirk, N. Y.
8 BZO	V. H. Barnes, 4223 Valley Rd	Cleveland, O.
8 BZP	Northern High School, 9026 Woodward Ave.	Detroit, Mich.
8 BZQ	K. Uncapher, 730 Woodland Ave	Van Wert, O.
8 BZR	H. L. Bergy, 327 E. Main St	Ionia, Mich.
8 BZS	C. H. Heald, 115 N. 17th St	Olean, N. Y.
8 BZT	N. Richard	Provemont, Mich.
8 BZU	C. Blakeslee, 111 Embargo St. E	Rome, N. Y.
8 BZV	C. C. Smith	Clarksfield, O.
8 BZW	S. B. King, 1238 Cleveland Ave	Flint, Mich.
8 BZX	D. S. Little, 1217 4th St. S. W.	Canton, O.
8 BZY	W. A. Gower, 219 Hague Ave	Detroit, Mich.
8 BZZ	H. Colton, 580 Melbourne Ave	Detroit, Mich.
8 CAA	O. H. Stalker, 123 N. State St	Ann Arbor, Mich.
8 CAB	R. Schlemmer, 8442 Curzon Ave	Cincinnati, O.
8 CAC	Grove City High School, Main St	Grove City, Pa.
8 CAD	L. Crick, 929 Lond Lake Ave	Alpena, Mich.
8 CAE	N. Gamrod, 109 Union St. S.	Rochester, N. Y.
8 CAF	W. Jones, 16 Pleasant St	Lancaster, N. Y.
8 CAG	M. & A. Bickhard, N. Main St	Antwerp, O.
8 CAH	J. G. Carr, 5 Summit St	Batavia, N. Y.
8 CAI	F. L. Williams, 514 S. Water St	Kent, O.
8 CAJ	J. Quilter, 10 St. John Ave	Binghamton, N. Y.
8 CAK	R. Andrews, Jr., 94 Earl St	Rochester, N. Y.
8 CAL	W. E. Landis, 1711 Pingree Ave	Detroit, Mich.
8 CAM	New River Co	Macdonald, W. Va.
8 CAN	The New River Co. (Southwestern),	Macdonald, W. Va.
8 CAO	J. V. Hope, 216 W. Scott St	Grand Ledge, Mich.
8 CAP	P. J. Wesch, 907 N. Adam St	Owosso, Mich.
8 CAQ	S. W. Miller, 184 Wingert St	Bucyrus, O.
8 CAR	A. L. Copley, 42 Myron Ave	Kenmore, N. Y.
8 CAS	C. Cummings, Bloomingdale Ave	Akron, O.
8 CAT	L. G. Dryer	Cattaraugus, N. Y.
8 CAU	F. Stevens, 164 W. Fountain St	Battle Creek, Mich.
2 CAV	P. W. Buck, 574 Marston Ave	Detroit, Mich.
8 CAW	R. E. Dean, 3846 33d St	Detroit, Mich.
8 CAX	A.R.Smith & W.H.Fuller, 2048 Park Ave	Detroit, Mich.
8 CAY	B. Stalnaker, 210 Graham St	Elkins, W. Va.
8 CAZ	J. C. Fountain, 2633 Walnut St	Port Huron, Mich.
8 CBA	R. F. Hudson, 900 E. Grand Blvd	Detroit, Mich.
8 CBB	L. Pike, 427 Union St	Grand Ledge, Mich.
8 CBC	F. Abbott, 1023 Adams St	Coshocton, O.
8 CBD	P. Dittmar, 545 Clifford Ave	Rochester, N. Y.
8 CBF	A. T. Gabris, 440 Coe St	Tiffin, O.

8 CBG	C. S. Yule, 319 3rd Ave	Frankfort, N. Y.
8 CBH	J. R. Waddell, 21 Russell Ave	Niles, O.
8 CBI	E. R. Romine, 152 Iroquois Ave	Pontiac, Mich.
8 CBJ	R. H. James, 157 High St	Lockport, N. Y.
8 CBK	W. Wegner, 136 Parce Ave	Fairport, N. Y.
8 CBL	H. George, Jr., 83 Parkwood Ave	Kenmore, N. Y.
8 CBM	R. L. Carter, 209 S. Union St	Galion, O.
8 CBN	R. Lockwood, 913 E. 146th St	Cleveland, O.
8 CBO	G. E. Wedemeyer, 511 E. Kingsley St	Ann Arbor, Mich.
8 CBP	H. Simmons, 143 Charlotte Ave	Detroit, Mich.
8 CBQ	H. Blanchard, 2908 Pingree Ave	Detroit, Mich.
8 CBR	W. Hauenstein, 453 S. Shawnee St	Lima, O.
8 CBS	J. Y. Van Antwerp, 35 S. Perry St	Johnstown, N. Y.
8 CBT	C. E. Law, 239 S. 4th Ave	Ilion, N. Y.
8 CBU	L. D. Kipe, 203 Summit Ave	Bellevue, Pa.
8 CBV	F. A. Reese, 135 Fulton St	Olean, N. Y.
8 CBW	W. C. Weaver, 1869 Wadena St	East Cleveland, O.
8 CBX	R. Lawrence, 1015 Garfield Ave	Springfield, O.
8 CBY	H. W. Hahn, 229 Lora Ave	Youngstown, O.
8 CBZ	L. Alexander, 3226 Maplewood Ave	Toledo, O.
8 CCA	C. E. Kemp, 921 Sherman St	Middletown, O.
8 CCB	L. Vangunten, 751 Brice Ave	Lima, O.
8 CCC	N. S. Vogt, 143 Walnut St	Wyandotte, Mich.
8 CCD	I. Paul, 144 Poplar St	Wyandotte, Mich.
8 CCE	R. K. Struble, 804 Asylum St	Flint, Mich.
8 CCF	S. P. Byers, 841 Philadelphia St	Indiana, Pa.
8 CCG	Moffitt1Graumlich Elec. Co., 336 Franklin St.,	Circleville, O.
8 CCH	H. Reams, 2554 Fairview Ave	Detroit, Mich.
8 CCI	N. J. Grob, 151 Bradley St	Buffalo, N. Y.
8 CCJ	R. J. Haley, 599 Grant St	Buffalo, N. Y.
8 CCK	H. Haywood, 140 Bradley St	Buffalo, N. Y.
8 CCL	R. G. Lister, 300 Belden Ave., N. E.	Canton, O.
8 CCM	J. O. Archibald, 60 Aurora St	Lancaster, O.
8 CCN	A. C. Morrow, 529 N. Church St	Elmira, N. Y.
8 CCO	M. Israelson	Hartfield, N. Y.
8 CCP	C. L. Clough, 1512 Richfield Rd	Flint, Mich.
8 CCQ	E. F. Bond, 311 Jerome Ave	Williamsport, Pa.
8 CCR	L. M. Grow, 312 Parker Ave	Toledo, O.
8 CCS	C. E. Bailey, 29 Grant St	Potsdam, N. Y.
8 CCT	A. W. Lewis, 102 Cliff St	Battle Creek, Mich.
8 CCU	T. A. Hart, Jr., 40 Filkins St	Fairport, N. Y.
8 CCV	S. Sellers, 922 N. Park St	Kalamazoo, Mich.
8 CCW	H. Harrington, R.F.D. No. 4	Mansfield, Pa.
8 CCX	A. G. Massey, 241 Paddock St	Watertown, N. Y.
8 CCY	F. L. Batchelder, 904 6th St	Muskegon, Mich.
8 CCZ	G. D. Oertel, 610 Bear St	Syracuse, N. Y.
8 CDA	R. Mee, 120 Glendale Park	Rochester, N. Y.
8 CDB	J. A. Fluke, South St	Clark Mills, N. Y.
8 CDC	A. H. Beach, 154 Apple St	Muskegon, Mich.
8 CDD	A. B. Bower, Fulton St	Armada, Mich.
8 CDE	R. Dearing, 66 Elm St	Mayville, N. Y.
8 CDF	F. Burt, 508 Chase St	Flint, Mich.
8 CDG	W. Sullivan, 90 Newton St	Fredonia, N. Y.
8 CDH	A. Molner, 88 Fayette St	Palmyra, N. Y.
8 CDI	W. S. Potter, Curtin St	Bellefonte, Pa.
8 CDJ	R. R. Boyden, 672 W. Liberty St	Medina, O.
8 CDK	H. J. Calderhead, 47 S. 8th St	Kenmore, O.
8 CDL	W. H. Stanley, 84 Claremont Ave	Buffalo, N. Y.
8 CDM	W. E. Rosevear, 2114 Cummings Ave	Newberry, Pa.
8 CDN	R. R. Washburn, Fourth Ave	Frankfort, N. Y.
8 CDO	C. Marlett, 7 Inwood Pl	Buffalo, N. Y.
8 CDP	M. L. Vest, 611 Randolph Ave	Elkins, W. Va.
8 CDQ	L. Wagner, 12 S. Rosina St	Somerset, Pa.
8 CDR	F. Fichtel, 37 Baynes St	Buffalo, N. Y.
8 CDS	T. N. Barnsdall, 146 E. Washington St	Bradfort, Pa.
8 CDT	H. J. Brosious, 226 N. 4th St	Lewisburg, Pa.
8 CDU	E. U. Snyder, Jefferson St	New Carlisle, O.
8 CDV	C. J. Sitterman, Cement St	Akron, O.
8 CDW	D. D. Bradley, 374 Bird St	Buffalo, N. Y.
8 CDX	W. McC. Slack, 210 South St	Delaware, O.
8 CDY	F. Castenholz, 425 S. LaGrave Ave	Grand Rapids, Mich.
8 CDZ	J. Evans, 905 S. Main St	Washington, C. H., O.
8 CEA	W. L. Taylor, 1607 S. Geddes	Syracuse, N. Y.
8 CEB	W. S. A. Mutter, 726 Northampton St	Buffalo, N. Y.
8 CEC	R. McRoberts, 115 W. Liberty St	Ann Arbor, Mich.
8 CED	L. Melvin, 1937 N. East St	Lansing, Mich.
8 CEE	H. N. Knight, 3840 Wabash Ave	Detroit, Mich.
8 CEF	R. Stephens, 454 McKee Ave	Monessen, Pa.
8 CEG	L. S. Saveland, 14418 Dover Ave	Cleveland, O.
8 CEH	T. Sage, Jr., 8650 Agnes Ave	Detroit, Mich.
8 CEI	P. G. Lambert, 903 Ross Ave	Wilkinsburg, Pa.
8 CEJ	J. M. Sherman, 2767 Bergman St	Pittsburgh, Pa.
8 CEK	L. McDowell, 6271 College Vue Pl	Cincinnati, O.
8 CEL	R. Johnstone, R.F.D. No. 2	Glenshaw, Pa.
8 CEM	J. C. Brittain, 1708 5th Ave	Beaver Falls, Pa.
8 CEN	F. Hollis, 2316 Patterson St	Pittsburgh, Pa.
8 CEO	A. W. McAuly, 309 3d St	Oakmont, Pa.
8 CEP	D. Wise, 2018 Mullane St	Detroit, Mich.
8 CEQ	G. Wegener, 1 Moffatt St	Carnegie, Pa.
7 CER	P. H. Lindauer, 1014 11th St	Lorain, O.
8 CES	M. L. Leppert, 241 S. Starr Ave	Bellevue, Pa.
8 CET	J. B. Steiner, 123 N. Elizabeth St	Lima, O.
8 CEU	Milan High School (by R. Hardy)	Milan, Mich.
8 CEV	P. King, Jr., Lake Placid Club	Lake Placid, N. Y.
8 CEW	R. B. Harter, 200 W. Main St	Frankfort, N. Y.
8 CEX	H. Seielstad, 217 S. Main St	Greensburg, Pa.
8 CEY	J. R. Lodge, 1703 6th Ave	Beaver Falls, Pa.
8 CEZ	T. D. Schumacher, 223 N. Rebecca St	Pittsburgh, Pa.
8 CFA	H. L. Baillie, 28 Bowers Ave	Newark, O.
8 CFB	H. E. Wallace, 7215 Whipple St	Swissvale, Pa.
8 CFC	H. M. Anderson, 507 Lawrence Ave	Ellwood City, Pa.
8 CFD	W. K. Hawk, R.F.D. No. 2	Jeannette, Pa.
8 CFE	T. A. Viehe, 72 Main St	Hamburg, N. Y.
8 CFF	E. M. Rhea, 1019 Heberton Ave	Pittsburgh, Pa.
8 CFG	P. A. Bauer, 4187 Chene St	Detroit, Mich.
8 CFH	J. C. O'Donnell, 1019 Chislett St	Pittsburgh, Pa.
8 CFI	M. N. Toy, 437 E. McKibben St	Lima, O.
8 CFJ	L. S. Mentzer	North Lima, O.
8 CFK	Elec. Equip. Co., G. B. Harris, 703 State St	Erie, Pa.
8 CFL	H. M. Wilkoff, 40 New York Ave	Youngstown, O.
8 CFM	J. C. Nicholson, 815 N. 12th St	Cambridge, O.
8 CFN	R. F. Hunt, 1607 Clairmont Ave	Cambridge, O.
8 CFO	R. C. Duncan, 1615 Church St	Detroit, Mich.
8 CEP	P. Thomas, 436 Elmer St	Pittsburgh, Pa.
8 CFQ	A. Corey	Lake Odessa, Mich.
8 CFR	R. C. Blair, 194 Glendale Ave	Highland Park, Mich.
8 CFS	C. A. Sweeny, Market St., Box 213	Freeport, Pa.
8 CFT	L. C. Michael, 166 Kennard Ave	Barnesville, O.
8 CFU	E. R. Mallory, 141 N. Spring St	Bellefonte, Pa.
8 CFV	E. L. Rosencrantz, R.F.D. No. 1	Windsor, N. Y.
8 CFW	W. H. Brown, 204 S. Jackson St	Jackson, Mich.
8 CFX	D. I. Dayton, Crim Ave	Belington, W. Va.
8 CFY	W. A. Hausding, 1004 Washtn. Ave	Traverse City, Mich.
8 CFZ	H. W. Peacock	Barker, N. Y.
8 CGA	J. W. D. Moore	New Straitsville, O.
8 CGB	P. C. Snyder, Lowrie & Gardner Sts	Pittsburgh, Pa.
8 CGC	J. C. Grady, 400 3d Ave	Frankfort, N. Y.
8 CGD	W. J. G. Cooper, 507 Washington Ave	Oakmont, Pa.
8 CGE	H. G. Rice, 1629 Ottawa Drive	Toledo, O.
8 CGF	C. C. Farnam	Sand Lake, Mich.
8 CGG	E. H. Wollmuth, 827 Bird Ave	Buffalo, N. Y.
8 CGH	H. C. Prall, 247 Jackson St	Saginaw, Mich.
8 CGI	C. R. Funk, E. Curtin St	Bellefonte, Pa.
8 CGJ	G. Hunter, Jr., 205 McConnell St	St. Johns, Mich.
8 CGK	M. C. Mattice, 35 Otsego St	Canajoharie, N. Y.
8 CGL	L. Pierce, 1409 Henderson Rd	Kalamazoo, Mich.
8 CGM	W. Dyke, 903 Fenimore St	Kalamazoo, Mich.
8 CGN	R. T. Brown, 49 Charlotte St	Akron, O.
8 CGO	L. E. Marks, 410 E. Main St	E. Palestine, O.
8 CGP	B. C. Angle, R.F.D. No. 2, Box 47	Connellsville, Pa.
8 CGQ	L. W. Goodnough, 44 Lydia St	Binghamton, N. Y.
8 CGR	L. Suhadolink, 37 Charlotte St	Akron, O.
8 CGS	G. D. Robey, Steubenville St	Cambridge, O.
8 CGT	P. T. Criswell, 107 Farragut Ave	Vandergift, Pa.
8 CGU	J. B. Lewis, 151 Park Ave	Watertown, N. Y.
8 CGV	H. F. Witzler	Perrysburg, O.
8 CGW	W. L. Everitt, 618 Steward Ave	Ithaca, N. Y.
8 CGX	C. R. Klinger, 443 Holt St	Dayton, O.
8 CGY	C. J. Crockett, 2490 Edison St	Detroit, Mich.
8 CGZ	W. A. Galloway, 664 S. Detroit Ave	Xenia, O.
8 CHA	L. Laird, 18 N. Race St	Greenville, Pa.
8 CHB	J. LeRoy Hearn, 3345 Harrison Ave	Cheviot, O.
8 CHC	G. W. Krug, 1219 Harvard Blvd	Dayton, O.
8 CHD	W. D. Collins, 312 Dixon Ave	Ben Avon, Pa.
8 CHE	P. F. Shuey, 2651 Bedford Ave	Pittsburgh, Pa.
8 CHF	E. T. Hill, 220 Oakmont Ave	Oakmont, Pa.
8 CHG	M. A. Splain, 1611 Mohawk St	Utica, N. Y.
8 CHH	B. B. Rouse, 1838 E. 101st St	Cleveland, O.
8 CHI	F. E. Maguire, 3409 Ward St	Pittsburgh, Pa.
8 CHJ	W. Vogel, 839 Observatory Ave	Cincinnati, O.
8 CHK	Sturgis Ohio Laboratory, P. S. Gray	Sturgis, Mich.
8 CHL	W. Mason, 284 Hampshire Ave	Buffalo, N. Y.
8 CHM	W. H. Bernadt, 34 Verona Pl	Buffalo, N. Y.
8 CHN	R. G. Hills, 106 Morgan St	Tonawanda, N. Y.
8 CHO	A. C. Heck, 410 Fairview St	Mannington, W. Va.
8 CHP	C.B.DeLaney, 115 Mannington Ave	Mannington, W. Va.
8 CHQ	C. H. Troy, 95 Galatin Ave	Buffalo, N. Y.
8 CHR	L. R. Bush, 67 Cliff St	Canajoharie, N. Y.
8 CHS	H. E. Hency, 39 Walnut St	Canajoharie, N. Y.
8 CHT	C. D. Mason	Cohoctah, Mich.
8 CHU	H. W. Cain, Felton St	Belington, W. Va.
8 CHV	W. C. Stevens, 815 Sunset St	Scranton, Pa.
8 CHW	J. H. Huffstidler, 737 Prospect Ave	Buffalo, N. Y.
8 CHX	R. K. Judy, 217 S. West St	St. Marys, O.
8 CHY	J. W. Schmidt, 44 Fuller St	Buffalo, N. Y.
8 CHZ	A. M. Griffing, W. Erie St	Linesville, Pa.

Ninth District

9 CA	George W. Bergman, 400 W. Chippewa St	Dwight, Ill.
9 CB	William C. Kohl, 210 N. Taylor Ave	Kirkwood, Mo.
9 CJ	R. O. Wahlmann, 3257A California Ave	St. Louis, Mo.
9 CR	Charles J. Reese, 1262 Argyle Ave	Chicago, Ill.
9 CT	Walter A. Hotz, 6325 Peoria St	Chicago, Ill.
9 CW	Arthur John Willing, 325 Monroe Ave	River Forest, Ill.
9 CX	William P. Willing, 610 N. Grove St	Oak Park, Ill.
9 BK	Raymond F. Fowler, 211 E. Clinton St	Frankfort, Ind.
9 DD	Henry G. Lindwall, 1020 Oak St	Winnetka, Ill.
9 DG	The State Fair, Adams & Dearborn Sts	Chicago, Ill.
9 DN	Popini & Haupt, 31 Morgan St	West Liberty, Ia.
9 DV	Homer U. Bishop, 210 E. 4th Ave	Neenah, Wis.
9 DY	Boyd W. Nestlerode, Jackson & 17th Sts	Sioux City, Ia.
9 DZ	St. John's Military Academy	Delafield, Wis.
9 ED	Robert C. Grozier, 100 N. Grand St	Chariton, Ia.
9 EF	Glenn Edwin Vogel, 249 S. Wayne St	Danville, Ind.
9 EI	Joseph C. Anderson, Glengarry Farm	Lexington, Ky.
9 EM	Guy L. Beech, 214 W. Washington St	Clarinda, Ia.
9 FB	Clarence F. Cornish, 2904 Thompson Ave.	Ft. Wayne, Ind.
9 FJ	Norval Richardson, 5056 N. Lincoln St	Chicago, Ill.
9 FM	Sidney J. Blum, 3930 Campbell St	Kansas City, Mo.
9 FO	Findley Elec. Co., Inc., 216 S. 5th St,	Minneapolis, Minn.
9 FP	Chris. B. Stelle, 1212 E. Madison St	South Bend, Ind.
9 FR	Joy and Kelsey, 4021 W. Kinzie St	Chicago, Ill.
9 FV	Allen Thomas Law, 2915 Douglas Pl	Denver, Colo.
9 FW	Grover Boyd Hamen, 810 Cowles Ave	Joliet, Ill.
9 FZ	Randall C. Ballard, 4454 Sheridan Rd	Chicago, Ill.
9 GA	Ernest H. Gager 1318 Eddy St	Chicago, Ill.
9 GE	Motor Boat Pierro, 606 Best Bldg	Rock Island, Ill.
9 GF	Arthur Elkins, 4923 Vincenmez Ave	Chicago, Ill.
9 GH	E. C. Varney, 608 E. 7th St	White Bear Lake, Minn.
9 GK	The Reineke Co., 117 Broadway	Fargo, N. D.
9 GL	Charles Triteline, 4221 Carrell Ave	Chicago, Ill.
9 HA	John Lackey, Main St	Harlan, Ky.
9 HC	James P. Wilson, 4119A DeTonty St	St. Louis, Mo.
9 HD	Robert S. Hale, 734 N. Pine Ave	Chicago, Ill.
9 HE	Edwin L. Murrill, Second Ave	Prestonsburg, Ky.
9 HE	G. R. Hammond, 219 S. 5th Ave	Oelwein, Ia.
9 HF	Boy Sc. of Am., Main & Division Sts	E. St. Louis, Ill.
9 HG	Harold Jay Griffin, 4620 Wakely St	Omaha, Neb.
9 HS	Walter Bissell, 502 McIndoe St	Wassau, Wis.
9 IB	Earl Stout, 713 S. Florence St	Taylorville, Ill.
9 IC	Albert E. Jeffrey, 5227 Ellis Ave	Chicago, Ill.
9 IG	M. W. Swanson, 1242 N. Knox Ave	Minneapolis, Minn.
9 IT	Herbert D. Norvell, 1127 Arrow Ave	Anderson, Ind.
9 IH	Welton H. Bozier, 4451 Westminister Pl	St. Louis, Mo.
9 II	G. Dewey Bauer, 2133 Weisser Pk. Ave.,	Ft. Wayne, Ind.
9 IL	Robert E. Schwab, 1637 Parkside Ave	Chicago, Ill.
9 IM	Donald A. Weller, 4336 N. Lowell Ave	Chicago, Ill.
9 IW	Adolph H. Haupt, 2442 Ogden Ave	Chicago, Ill.
9 IX	West & Dedricks, 1404 Michigan Ave	Manitowoc, Wis.
9 JJ	Arthur L. Pierce, 1109 Ferry St	LaCrosse, Wis.
9 JB	Waldo E. Propst	Geneva, Neb.
9 JI	Lawrence Dutton, 940 37th St	Milwaukee, Wis.
9 JN	Leonard S. Stenerson, N. Grand St	Ames, Ia.
9 JX	Ned Van Campe, 6539 Greenwood Ave	Chicago, Ill.
9 KI	Edmond B. Mangan, 6828 Laflin St	Chicago, Ill.
9 KM	Lawton Biddle, 442 N. Boston Ave	Indianapolis, Ind.
9 KP	L. G. Leonard, Jr., 4801 Woodlawn Ave	Chicago, Ill.
9 LE	Charles W. Brestle, 137 W. 28th St	Indianapolis, Ind.
9 LJ	Edwin W. Gould, 208 S. 5th St	Norfolk, Neb.
9 MF	Edmund Henry Scholz, 324 14th St	St. Cloud, Minn.
9 MI	Earl D. Billiter, Box 167	Dell Rapids, S. D.
9 MK	Wm. V. Kirkpatrick, 116 N. 14th St	Richmond, Ind.
9 ML	Kenneth McLead, 2856 St. Vincent Ave	St. Louis, Mo.
9 MN	Marvin Messing, 213 W. Salena St	Freeport, Ill.
9 ND	Alex J. H. Smith, 765 Vernon Ave	Glencoe, Ill.
9 NK	E. B. Yates, 1415 Jonquil Terr	Chicago, Ill.
9 NL	David L. Waters, 418 2nd Ave	Albia, Ia.
9 NT	John C. Sampson, 3029 Eads Ave	St. Louis, Mo.
9 NY	Francis W. Ewing, Woodcraft School	Culver, Ind.
9 OF	Charles L. Krapf, 216 Myrtle St	Waukegan, Ill.
9 OJ	David R. Dunlap	Westboro, Mo.
9 OL	D.A.R. Rad. Cl. of Menominee, State St,	Menominee, Mich.
9 OV	L. E. Oldfield, 36 Thacher Ave	River Forest, Ill.
9 OW	Elder W. Bates, 430 E. 110th Pl	Chicago, Ill.
9 PB	H. D. Barton, 107 E. Franklin St	Crawfordsville, Ind.
9 PF	Robert A. Pence, 4120 Gulford St	Indianapolis, Ind.
9 PG	Conant Manning, 431 Linden Ave	Highland Park, Ill.
9 PK	Phi Kappa Sigma, 3420 Michigan Ave	Chicago, Ill.
9 QK	Ray Hecht, 5612 Kenwood Ave	Chicago, Ill.
9 QN	Austin High School, 5417 Fulton St	Chicago, Ill.
9 QE	Ivan J. Bulock, 1004 North Ave	Fairmont, Minn.
9 QR	W. M. Enslen, Jr., 2216 Fairfield Ave	Ft. Wayne, Ind.
9 QX	Fred W. Caleson, 244 W. 7th St	Superior, Wis.
9 RB	Robert W. Burns, 135 E. Suttenfield St	Ft. Wayne, Ind.
9 RC	F.M.Clarke & R.D.Wahlstrom, 1711 Estes Av,	Chicago, Ill.
9 RE	Wilber E. Menigan, 1824 Market St	Logansport, Ind.
9 RD	John Henry Kemmett, 1953 LaCrosse Ave	Chicago, Ill.
9 RF	Frederick Lincoln Shaw, 2411 15th St	Denver, Colo.
9 RM	William H. Earle, 1621 River St	Iowa Falls, Ia.
9 SS	Snelling Rad. Cl., 3115 Snelling Av	Minneapolis, Minn.
9 SE	Saynor August Schink, 18 Main St	Chilton, Wis.
9 SH	Richard S. Reynolds, 454 60th St	Chicago, Ill.
9 SJ	G. F. Grossman, Carrollton Radio Shop,	Carrollton, Mo.
9 SO	Geo. H. Goddard, Jr., 4370 McPherson St.,	St. Louis, Mo.
9 SP	Sewell P. Wright, 408 W. Monroe St	Springfield, Ill.
9 SR	Engel & Appling, 566 E. 4th St	Newport, Ky.
9 TD	Hobart D. Ashlock, 87 W. Pleasant St	Noblesville, Ind.
9 TE	Anthony J. McEntee, 244 Green St	Tipton, Ind.
9 TF	Richard A. Gatzek, 317 S. 5th St	Richmond, Ind.
9 TI	Irving T. Patridge	Milbank, S. D.
9 TK	Ralph Edgar Foss, 1321 E. 53rd St	Chicago, Ill.
9 TL	William Turner Lewis, 1632 Park Ave	Racine, Wis.
9 TR	Richard H. Burr, 1300 Grattan St	St. Louis, Mo.
9 UC	C. W. Kronmiller, 2908 Weisser Pk Av.,	Ft. Wayne, Ind.
9 UB	Charles L. MacBrace, 8813 Buffalo Ave	S. Chicago, Ill.
9 UP	A. J. Zeithammel, 1356 S. Keeler Ave	Chicago, Ill.
9 UE	Jackman Elec. Co., 924 Central Ave	Fort Dodge, Ia.
9 UM	George L. LaPlant	St. Anthony, Ia.
9 UN	Clyde E. Wiley, 28 Parker St	Tuscola, Ill.
9 UO	Roy L. Black, 1271 S. Lincoln St	Denver, Colo.
9 VA	William C. Moore, 1009 19th St	Manitowoc, Wis.
9 VG	John Lindsay Greene, 1307 4th St	Louisville, Ky.
9 VK	F. H. Lester, 1155 Wisconsin Ave	Oak Park, Ill.
9 VI	Hale Talmage Cottrell, 1214 Allen St	Owensboro, Ky.
9 VG	Ralph W. Elliott, 308 S. 1st St	Independence, Kan.
9 WH	Daniel B. Gould, 1436 Birchwood Ave	Chicago, Ill.
9 WA	Roy H. Owen, 627 Frederica	Owensboro, Ky.
9 WD	William D. Pyle, 429 S. Sherman St	Denver, Colo.
9 WF	Y.M.C.A. Radio Club, 9th & Cedar Sts	St. Paul, Minn.
9 AAD	Edward J. Doyle, 1440 Chase Ave	Chicago, Ill.
9 AAL	George H. Frank, 2957 Racine St	Chicago, Ill.
9 AAU	Carl Klonk, 3148 Halliday Ave	St. Louis, Mo.
9 ABM	Wilbert Brown, 4815 Culloma Ave	Chicago, Ill.
9 ABV	Clifford H. Rogers, 226 E. 6th St	Hutchinson, Kan.
9 ACJ	Chicago Rad. Assembly, 2512 Blue Isl. Ave.,	Chicago, Ill.
9 ACK	John Sauer, Jr., 174 Martin St	Milwaukee, Wis.
9 AEL	Richard T. Taggert, 247 N. Monroe St,	Mooresville, Ind.
9 AEM	Leslie E. Hart, 1027 Main St	Richmond, Ind.
9 AES	Bert. W. Huevelman, 3141 N. Sawyer Ave	Chicago, Ill.
9 AFL	Carl S. Tunwall, 24-26 S. 9th St	Ft. Dodge, Ia.
9 AFL	Gerald Hoffman, 5124 Maple Ave	St. Louis, Mo.
9 AFR	Central Illinois Radio Club	Springfield, Ill.
9 AFW	Dale E. Halloway	Churdan, Ia.
9 AGG	Harold G. Cutler, 116½ Richmond Ave	Richmond, Ind.
9 AGO	Francis C. Miller, 1807 S. Adams St	Marion, Ind.
9 AHH	R. H. Williamson, 715 S. Iowa Ave	Eagle Grove, Ia.
9 AHQ	Clarence H. Phillabaum, East 6th St	Mendota, Ill.
9 AID	Graham L. Tevis	Humansville, Mo.
9 AIZ	Harvey Hall, 1731 Winona St	Chicago, Ill.
9 AJM	George A. Laney, 715 E. 7th St	Pittsburg, Kan.
9 AJO	Frank E. Hutton, 5040 Wernon Ave	St. Louis, Mo.
9 AJW	Ralph T. Woodruff, 649 N. 37th St	E. St. Louis, Ill.
9 AJX	Paul F. Black, 514 S. Main St	Aberdeen, S. D.
9 AJY	Walter J. Hammond, 712 E. 7th St	Pittsburg, Kan.
9 AKO	Wilbert Lindwall, 4916 Lowell Ave	Chicago, Ill.
9 ALB	French H. Willis, Box 34	Carlisle, Ind.
9 ALW	R. L. Van Osdol, 304 E. Lincoln Way	Morrison, Ill.
9 ALX	Stanley Tollman, 5346 Patton St	St. Louis, Mo.
9 AMH	Albert E. Bathiany, 601 Monmouth St	Newport, Ky.
9 AMJ	Edw. A. Ramsey, 108 H. College Ave	Assumption, Ill.
9 AMM	Boy Scouts of America, Camp Cheaugue	Palatine, Ill.
9 ANA	Louis A. Wollaeger, 2728 State St	Milwaukee, Wis.
9 AOT	Abe Ginsburg, 2925 Pine Grove Ave	Chicago, Ill.
9 APC	Arthur Poole, 241 Melrose Ave	Kenilworth, Ill.
9 AUP	Herbert P. Dalton	Kirkland, Ill.
9 AWM	Lloyd V. Berkner, 117 E. Summit St	Sleepy Eye, Minn.
9 AWD	F.A.Metcalf, Jr., 700 Oak St	Steamboat Springs, Colo.
9 AZS	Frank Stude, 2023 Lincoln Ave	Chicago, Ill.
9 BAA	Clifford Shoenhardt, 2251 B St	Granite City, Ill.
9 BAB	Frank Whitson, 4431 Blair Ave	St. Paul, Mo.
9 BAC	Alfred A. Stephenson, 738 68th Ave	West Allis, Wis.
9 BAD	Robert and Donald Cassels	Ellendale, N. D.
9 BAE	Damon C. Borders, 1326 Olive St	Indianapolis, Ind.
9 BAF	C. Gilford Peterson, 401 S. 9th St	Brainerd, Minn.
9 BAG	Frank E. Smolek, 4452 S. Troy St	Chicago, Ill.
9 BAH	Harold H. Hailstone, 444 Orient Ave.	Carlinville, Ill.
9 BAI	Bernhardt Brabender, 414 S. 5th St	Evansville, Ind.
9 BAJ	Elmer Everett Herring, 509 N. 2nd St	Marshalltown, Ia.
9 BAK	Virgil E. Thomas, 111 S. Dix St	Muncie, Ind.
9 BAL	Roy William Pratt, 611 Pleasant St	Rockwell City, Ia.

9 BAM	Walter Henry Dryden	Fredonia, Kans.
9 BAM	F. A. Burrows, 2224 Giddings St	Chicago, Ill.
9 BAN	James B. McPherson, 524 S. 7th St	Brainerd, Minn.
9 BAO	Lewis W. Sieck, Jr., 2000 Benton St	St. Louis, Mo.
9 BAP	Roger D. Brunn, 402 Cortlandt St	Waterloo, Ia.
9 BAQ	Clark Chandler, 1304 1st Ave. W	Cedar Rapids, Ia.
9 BAR	Earl George Baugher	Farmington, Ia.
9 BAS	Carl H. Kaempfer, 322 4th Ave	West Bend, Wis.
9 BAT	W. G. Congram, R.F.D. No. 3, Box 7	Francesville, Ind.
9 BAU	James L. Fetters, 516 N. Second St	Marshalltown, Ia.
9 BAV	Everett W. McQuillin, 701 S. 7th St	Brainerd, Minn.
9 BAW	Roscoe E. Pugh	Allerton, Ill.
9 BAX	Burton Frank Miller	Coloma, Wis.
9 BAY	William R. Perry, 737 California St	Columbus, Ind.
9 BAZ	John Bernard Wathan, 1374 S. 3rd St	Chicago, Ill.
9 BBA	Ben A. Ott	LaCrosse, Wis.
9 BBC	L. E. McDonough, 1845 Carroll Ave	St. Paul, Minn.
9 BBD	Gerhardt Palmer Walseth	Ortonville, Minn.
9 BBE	John O. Weaver, 428 Tonti St	LaSalle, Ill.
9 BBF	Ernest T. Sperling, 11 S. Jefferson St	New Ulm, Minn.
9 BBG	Elmo Weisenbeyer, 1523 Jefferson St	Great Bend, Kan.
9 BBH	E. G. Hackleman, 5438 Lowell Ave	Indianapolis, Ind.
9 BBI	Albert Kahn, 1069 Riverside Dr	South Bend, Ind.
9 BBJ	J. R. Freyermuth, 615 E. Lincoln Way,	South Bend, Ind.
9 BBK	Emil Wetzler, 2916 Cherry St	Milwaukee, Wis.
9 BBL	Ralph Schwartz, 710 Webster St	Kokomo, Ind.
9 BBM	E. H. Potter, Jr., 526 N. Main St	South Bend, Ind.
9 BBN	Wisconsin Rad. League, 1227 Center St,	Milwaukee, Wis.
9 BBO	K. R. J. McDermitt, 424 LeMonte Ter	South Bend, Ind.
9 BBP	Dean Hardesty, E. Lyons St	Swayzee, Ind.
9 BBQ	S. J. Holland, 2101 Lincoln Way, W	South Bend, Ind.
9 BBR	Joseph A. Brence, 1428 Adams St	Waukegan, Ill.
9 BBS	Anton Mix, 1414 Adams St	Waukegan, Ill.
9 BBT	Thomas James Keogh, 435 15th Ave	Clinton, Ia.
9 BBU	Antone Arnold, 208 Gary St	Menominee, Mich.
9 BBV	George Melvin Dunn	Broadlands, Ill.
9 BBW	Jack Forrest, 312 Ottawa Ave	Dixon, Ill.
9 BBX	Charles Speedie, 1327 J St	Lincoln, Neb.
9 BBY	Wayne McDougal, 1004½ Nicollet St.,	Minneapolis, Minn.
9 BBZ	Leslie Harlan	Hillsboro, Ia.
9 BCA	John G. Kuespert, 1216 S. Fellows St	South Bend, Ind.
9 BCB	Roland G. Palmer, 144 E. 16th St.	Chicago Heights, Ill.
9 BCC	Dwight Jones Stebbins, 114 W. 10th St	Morris, Minn.
9 BCD	Bendix J. Studeman, 802 S. 6th St	Lyons, Ia.
9 BCE	M. C. Sisney, Jr., 411 Sycamore St	Carbondale, Ill.
9 BCF	Elmer A. Gunther, 514 S. 11th Ave	Fort Dodge, Ia.
9 BCG	Clarence A. Myers, 324 W. 15th St	Connersville, Ind.
9 BCH	Erwin A. Rasmussen, 205 N. Park Ave	Oshkosh, Wis.
9 BCI	Arnold Theodore Teeter	Hillsboro, Ia.
9 BCJ	C. C. Messman, 726 Atlanta Ave	Webster Groves, Mo.
9 BCK	William Crowley, Jr., 800 Grand Ave	Menominee, Mich.
9 BCL	Richard F. Conner, 520 E. Elm St	New Albany, Ind.
9 BCM	Robert H. Smith, 418 5th St	Ames, Ia.
9 BCN	Charles Louis Valley, 1100 Irving Pl	Racine, Wis.
9 BCO	Eric William Johnson	Maysville, Mo.
9 BCP	John Alden Pfau, 222 Clark St	Mankato, Minn.
9 BCQ	Osman Y. Starner, 1009 Fayette Ave	Effingham, Ill.
9 BCR	Martin Edwards, 820 E. 9th St	Kansas City, Mo.
9 BCS	F. E. Bollom, Jr., 1010 Washington Ave.,	Racine, Wis.
9 BCT	C. J. Kriel, 1538 W. Vermont St	Indianapolis, Ind.
9 BCU	Edward Rahmer, 11 Shelby Court	Omaha, Neb.
9 BCV	Joyce Edison Prather, Oak St	Mounds, Ill.
9 BCW	J. A. Slusser, 4211 Bryant St	Denver, Colo.
9 BCX	James Emory Smith, 334 W. Center St	Sikeston, Mo.
9 BCY	Marius Plumly	West Liberty, Ia.
9 BCZ	Anton Tomasek, 1322 Lami St	St. Louis, Mo.
9 BDA	Leigh Meryl Matthews	McClure, Ill.
9 BDB	Gerard Harrington, 202 N. 15th St	Richmond, Ind.
9 BDC	Carl Elmer Johnson, 503 7th Ave. S	Wausau, Wis.
9 BDD	William Crouch, 708 E. Broadway	Waukesha, Wis.
9 BDE	Charles E. Weigel, R.F.D. No. 13	Jeffersontown, Ky.
9 BDF	Henry William Hoffman, 1826 N. Peoria St	Peru, Ill.
9 BDG	Albert Merle Goulter, 209 Smith St	Rockwell City, Ia.
9 BDH	Frank Kester	Elk Point, S. D.
9 BDI	Arthur J. Weber, 1415 Dolman St	St. Louis, Mo.
9 BDJ	Fallsner Epstein, 361 South St	Kenosha, Wis.
9 BDK	Lumir Dytrt, 1707 C St	Cedar Rapids, Ia.
9 BDL	Kendall M. North, 5634 Winthrop Ave	Chicago, Ill.
9 BDM	Robert Lynn Bunch, 519 N. Monroe St	Decatur, Ill.
9 BDN	Julian A. Parvin	Avondale, Mo.
9 BDO	R. E. Groetzinger, 101 W. Main St	Chilton, Wis.
9 BDP	Vance Phillips, Missouri Military Acad	Mexico, Mo.
9 BDQ	Emmete E. Brown	Blocton, Ia.
9 BDR	Harold M. Pirie, 427 11th Ave. S	Fort Dodge, Ia.
9 BDS	Elmer Phil Lind, 213 S. Middle St	Cape Girardeau, Mo.
9 BDT	David W. Ferroe, Main St	Sargent, Neb.
9 BDU	Henry C. Myers, 1731 Washington St	Lincoln, Neb.
9 BDV	Faltine K. Billau, 5855 Dewey Ave	Indianapolis, Ind.
9 BDW	Andrew F. Brandall, 3923 N. 17th St	Omaha, Neb.
9 BDX	William C. K. Irwin, 964 S. Sixth St	Louisville, Ky.
9 BDY	William P. Spain, 3812 W. Ohio St	Chicago, Ill.
9 BDZ	Henry Stubenrauch, Jr., 3118 Park Ave.,	Kansas City, Mo.
9 BEA	Robert D. Wahlstrom, 402 E. John St	Champaign, Ill.
9 BEB	Linton H. Flocken, 207 E. Oregon St	Urbana, Ill.
9 BEC	Marvin A. Nash, 1700 E. 13th St	Muncie, Ind.
9 BED	Leslie B. Essington, 4412 Farlin Ave	St. Louis, Mo.
9 BEE	Forrest F. Spencer, 219 Elm St	Mounds, Ill.
9 BEF	William Rundell, 236 Wesley Ave	Oak Park, Ill.
9 BEG	Ivan Lester Inghram, 512 Third St	West Liberty, Ia.
9 BEH	Chester E. Wolff, 818 E. Burnett Ave	Louisville, Ky.
9 BEI	Board of Education	Mason City, Ia.
9 BEJ	Raymond Kohl, 3124 Edgar St	Maplewood, Mo.
9 BEK	Thomas Dudman, 281 Sumner St	Galesburg, Ill.
9 BEL	Hiland Belford Fillmore, 386 Hendee St	Elgin, Ill.
9 BEM	August R. Ryan, 2347 S. 10th St	St. Louis, Mo.
9 BEN	F. W. Scholl, Jr., 3305 N. Meridian St.,	Indianapolis, Ind.
9 BEO	Russell H. Miller	Sheridan, Ill.
9 BEP	John Gilbert Princell, 215 Birchwood Ave	Louisville, Ky.
9 BEQ	Verner Rogers, 3250 Bryant St	Denver, Colo.
9 BER	Raymond Owen Wise, 3rd St	Villisca, Ia.
9 BES	Earl W. Springer, R.R.-H, Box 364	Indianapolis, Ind.
9 BET	Clayton Marion Powell, 1631 19th St	Boulder, Colo.
9 BEU	Harold Arthur DePew, 529 Market St	Iowa City, Ia.
9 BEV	Edgar Oscar Hansen, 2108 Vinton St	Omaha, Neb.
9 BEW	Edwin B. Streater, 211 Clark St	Maukota, Minn.
9 BEX	Almon H. Coulter, 1279 Marion St	Denver, Colo.
9 BEY	John L. Scroggin	Oak, Neb.
9 BEZ	Kenneth Dale Fox	Dallas Center, Ia.
9 BFA	Joseph A. Hansman, 1934 Lami St	St. Louis, Mo.
9 BFB	Marcus C. Osborn, 1030 S. 8th St	Lyons, Ia.
9 BFC	Edmund C. Lipp, 1018 Wilker Pl	Racine, Wis.
9 BFD	John H. Pendleton, 414 Hardesty St	Kansas City, Mo.
9 BFE	Laurence C. Hicks, 1000 Grant St	Denver, Col.
9 BFF	L. F. Pelletier, 2521 Ridgeland Ave	Berwyn, Ill.
9 BFG	Robert H. Phillips, 123 S. 4th St	Clear Lake, Ia.
9 BFH	Everett B. Robinson	Sheridan, Ill.
9 BFI	Elroy Barnhart, 617 N. 1st St	Aberdeen, S. D.
9 BFJ	James R. Frigon, 834 S. Kenilworth Ave	Oak Park, Ill.
9 BFK	Fred G. Harlow, 2518 Magazine St	Louisville, Ky.
9 BFL	Ora J. Coppock, 9 Court St	Tipton, Ind.
9 BFM	Gerald F. Hiday, 1909 Holloway St	Indianapolis, Ind.
9 BFN	Clifford McNally, 1048 Hamilton Ave	Indianapolis, Ind.
9 BFO	R. A. Braden, 1814 E. 1st St	Duluth, Minn.
9 BFP	W. A. Mivelaz, 2218 Broadway	Louisville, Ky.
9 BFQ	Gordon F. Laing	Courtenay, N. D.
9 BFR	James W. Van Schaick	Salem, S. D.
9 BFS	E. Trolander, 4139 Pillsbury St	Minneapolis, Minn.
9 BFT	Ralph L. Hutchinson, 315 Dayton Ave	St. Paul, Minn.
9 BFU	George Ball, 210 Kellogg Ave	Ames, Ia.
9 BFV	Oscar Borseth, 1521 Farnam St	LaCrosse, Wis.
9 BFW	Francis P. Keegan, 3323 Q St	Omaha, Neb.
9 BFX	Arthur J. Maus, 2339 Cullom Ave	Chicago, Ill.
9 BFY	Orestes Rundhough, 922 Hood St	LaCrosse, Wis.
9 BFZ	Jesse L. Worden, 6916 Eggleston Ave	Chicago, Ill.
9 BGA	Edwin E. Morgan, 646 Adams St	Oak Park, Ill.
9 BGB	Herman A. Bahr, 543 19th St	Oshkosh, Wis.
9 BGC	Theodore G. Vaky, 212 Columbia Ave	Champaign, Ill.
9 BGD	Irving H. Cohn, 110 Daniel St	Kendalville, Ind.
9 BGE	Sterling Electric Co., 33 S. 5th St	Minneapolis, Minn.
9 BGF	Edward H. Cook, 1010 W. Wayne St	Fort Wayne, Ind.
9 BGG	Sylvester B. Parr, 2119 Lothrop St	Omaha, Neb.
9 BGH	Jerry P. Gillett, R. R. No. 2	Rippley, Ia.
9 BGI	Evon M. Christeson, 718 S. 1st St	Eagle Grove, Ia.
9 BGJ	Thos. A. Maxwell, Jr., 644 N. 24th St	Lincoln, Neb.
9 BGK	Richard Leonard Duncan	Hancock, Minn.
9 BGL	Durant T. Rice, 1321 S. 35th Ave	Omaha, Neb.
9 BGM	Dave C. Fitz	Dallas Center, Ia.
9 BGN	Kenneth Van Atta	West Liberty, Ia.
9 BGO	R. C. Lindsay, 5012 Washburn Ave	Minneapolis, Minn.
9 BGP	Orville Crawley	Danville, Ind.
9 BGQ	Albert John Schroder, 61 W. 112th St	Chicago, Ill.
9 BGR	William Trelease, Jr., 804 S. Lincoln Ave	Urbana, Ill.
9 BGS	Lawrence E. Baker	Fairfax, Mo.
9 BGT	P. Loyet, R. R. No. 1, Jersey Ridge Rd	Davenport, Ia.
9 BGU	Arthur Rekenthaler, 622 21st St	Milwaukee, Wis.
9 BGV	Ray Matthew Harding, 864 20th St	Des Moines, Ia.
9 BGW	Ernest Grey, 1234 W. 36th St	Indianapolis, Ind.
9 BGX	Oscar F. Bleckert, 512 S. 8th St	Aberdeen, S. D.
9 BGY	W. N. Sweetland, 106 N. Bradley St	Indianapolis, Ind.
9 BGZ	Paul Ivan Weniger, 413 W. 8th St	Cresco, Ia.
9 BHA	George Grant Kibbee	Forest City, Ia.
9 BHB	Herbert Alexander Lynes, 906 Nichols St	Fulton, Mo.
9 BHC	Herman David Elledge	Cincinnati, Ia.
9 BHD	Robert Clair Kane	Warren, Ill.
9 BHE	Ralph E. Turner, 419 Cottage Ave	Glen Ellyn, Ill.
9 BHF	Verdon Stones, 571 Harper St	St. Louis, Mo.
9 BHG	Warrick Ankerson, 2221 Dayton St	Chicago, Ill.
9 BHH	Fred S. Palm, 6012 W. 29th St	Clyde, Ill.
9 BHI	Julius Carl Cleas, 3531 Juniata St	St. Louis, Mo.
9 BHJ	Frederick Gabler, 702 W. 8th St	Coffeyville, Kan.
9 BHK	A. Foster Sheller	Dallas Center, Ia.
9 BHL	Lawrence Topp, 1033 N. Lawndale Ave	Chicago, Ill.
9 BHM	Truman Van Norman, R.F.D. No. 3	Naperville, Ill.
9 BHN	George D. Wilson, 411 Osage St	Leavenworth, Kan.
9 BHO	Reuben Schultz, R.F.D. No. 3, Box 109	Naperville, Ill.
9 BHP	William C. Bliss, 4929 Lotus Ave	St. Louis, Mo.
9 BHQ	Dallas W. Jansen, 719 Oneida St	Appleton, Wis.
9 BHR	Leo Albert Coash, 594 Kimball St	Danville, Ill.
9 BHS	A. M. Bullock, 3600 Gladstone Blvd	Kansas City, Mo.
9 BHT	Mark Waggoner	Waggoner, Ill.
9 BHU	Edward Thrash, 713 S. Elm St	Champaign, Ill.
9 BHV	Robert B. Mager, 106 S. Madison Ave	LaCrosse, Ill.
9 BHW	Robert Pogue, 367 W. Main St	Danville, Ind.
9 BHX	Erick Winter, 1538 Marietta St	Decatur, Ill.
9 BHY	Lane M. Axtell, 119 N. 32nd Ave	Omaha, Neb.
9 BHZ	Roy E. Olmsted, 15 Miles northeast	Wauneta, Neb.
9 BIA	Carl A. Bergfers, 603 Carney Blvd	Marinette, Wis.
9 BIB	Harold J. Pansch, 1237 Blaine Ave	Racine, Wis.
9 BIC	Raymond A. Hindert	Minonk, Ill.
9 BID	Elvis Guy Foley	Fairfax, Mo.
9 BIE	Robert D. Ferree, 23 S. Elm St	Webster Groves, Mo.
9 BIF	Edwin F. Havens, 1307 Des Moines St	Des Moines, Ia.
9 BIG	Robert Dunville, 3144 S. Grand Ave	St. Louis, Mo.
9 BIH	Edward J. Hass, 4934 Augusta St	Chicago, Ill.
9 BII	Rudolph Bostleman, 26 Elmwood Ave	LaGrange, Ill.
9 BIJ	Orin Louis Denton, 211 Foraday St	Peoria, Ill.
9 BIK	Andrew G. Woolfries, 510 Sumner St	Waterloo, Ia.
9 BIL	Russell A. Andrews, 2345 Geddes Ave	Decatur, Ill.
9 BIM	Harold R. Lisenby, 411 W. Green St	Champaign, Ill.
9 BIN	J. F. Schoffman, 66 Lyndale Ave	Minneapolis, Minn.
9 BIO	Philip B. Middleton, 519 S. Eastern St	Eagle Grove, Ia.
9 BIP	William Morel Stolle	Mokane, Mo.
9 BIQ	Frank Romadka, 1403 W. Randolph St	Chicago, Ill.
9 BIR	Robert Earl Easton, 2041 Lafayette St	Denver, Colo.
9 BIS	Charles Wood, 639 15th Ave	Cedar Rapids, Ia.
9 BIT	Tom Sterling Clark, 1260 Jasper St	Decatur, Ill.
9 BIU	Earl B. Sutherlin, Route No. 1	Bainbridge, Ind.
9 BIV	Benjamin J. Palen, 505 W. 5th St	Winona, Minn.
9 BIW	Leon E. Hammarley, 404 E. 15th St	Kansas City, Mo.
9 BIX	Theodore C. Jacoby, 801 W. Oakland St	Kirkwood, Mo.
9 BIY	Harris Hall Quick, 830 Walnut St	Connersville, Ind.
9 BIZ	Howard Powers, 127 Jefferson St	Toulen, Ill.
9 BJA	Merwyn H. Reed, 1103 6th Ave	Sterling, Ill.
9 BJB	Leon Travis Noel	Tarkie, Mo.
9 BJC	John G. Carlisle, 1308 Montgall Ave	Kansas City, Mo.
9 BJD	Carroll L. Duncan, 1216 S. Lincoln St	Aberdeen, S. D.
9 BJE	Alfred Baumgartner, Wartburg College	Clinton, Ia.
9 BJF	Randall C. Ballard, 203 E. White St	Champaign, Ill.
9 BJG	H. C. Hoyer, R.F.D. No. 2, Box 39	Vermilion, S. D.
9 BJH	Thomas Frank Drury, 4221 Ridgeway Ave	Chicago, Ill.
9 BJI	Fred Leonard Hicks, 3935 W. 30th Ave	Denver, Colo.
9 BJJ	Kenneth Mindrum, 3208 S. 3rd Ave	Minneapolis, Minn.
9 BJK	Stuart G. Ellis, 424 Emerson St	Denver, Colo.
9 BJL	David Middleton, 5601 Lowell Ave	Indianapolis, Ind.
9 BJM	William H. Taussig, 549 E. Argonne Dr	Kirkwood, Mo.
9 BJN	Charles V. Dixon, 411 Fannie Ave	Wichita, Kan.
9 BJO	Karl E. Wiese, R.F.D. No. 1	Lone Tree, Ia.
9 BJP	Paul Larson, 2610 Polk St	Minneapolis, Minn.
9 BJQ	B. S. Ellsworth, 3830 Sheridan Blvd	Lincoln, Neb.
9 BJR	D. G. Lovelace, 1465 Roosevelt Ave	Indianapolis, Ind.
9 BJS	Burt E. Moritz, Jr., 1664 Steele St	Denver, Colo.
9 BJT	Harry M. McCormick, 112 4th St	Streator, Ill.
9 BJU	A. J. Aleksonis, 1220 S. Victory St	Waukegon, Ill.
9 BJV	R.H.Hardenbergh, 1017 N.Logan Av	Minneapolis, Minn.
9 BJW	Herbert W. Wengell, 4816 N. 3rd Ave	Omaha, Neb.
9 BJX	Lloyd N. Wilhelm, 4408 Farnum St	Omaha, Neb.
9 BJY	Charles G. Wagner, 208 W. 5th St	Chicago, Ill.
9 BJZ	Alfred H. Beech, 240 E. Main St	Sleepy Eye, Minn.
9 BKA	Carl H. Phillips, 1031 S. Emerson St	Denver, Colo.
9 BKB	M. C. Rogers, 23 18th Ave. N. E	St. Paul, Minn.
9 BKC	Walter E. Zube, 1208 S. 5th St	LaCrosse, Wis.
9 BKD	Francis J. Beck	Ortonville, Minn.
9 BKE	Lorin C. Collins, 4456 N. Monticello Ave.,	Chicago, Ill.
9 BKF	T. V. DeHaven, 1134 S. Washington St	Denver, Colo.
9 BKG	Earl William Lewis, 514 Williams St	Moberly, Mo.
9 BKH	Raymond Rathert	Cresco, Ia.
9 BKI	Arthur H. Chandler, 506 S. Main St	Waupaca, Wis.
9 BKJ	John P. Morton, 500 Lake Ave	White Bear Lake, Minn.
9 BKK	Robert D. Baughman, 711 E. 15th St	Kansas City, Mo.
9 BKL	Merle A. Plummer, 617 W. 8th Ave	Cedar Rapids, Ia.
9 BKM	Ralph W. George, 1612 Arkansas Ave	Wichita, Kan.
9 BKN	Miles S. Cooper, 1716 Selby St	St. Paul, Minn.
9 BKO	E. L. Dillard, 300A East 33rd St	Kansas City, Mo.
9 BKP	Harold R. Dornquast, 205 Front St	Owatonna, Minn.
9 BKQ	James M. Morris, 115 Gaskins St	Harrisburg, Ill.
9 BKR	Mike August Podhern, Box 85	Wood River, Ill.
9 BKS	Byron Carlisle, 1308 Montgall Ave	Kansas City, Mo.
9 BKT	Noel W. Harman, 711 N. 28th St	Omaha, Neb.
9 BKU	Sam F. Bowlby, 212 N. 10th St	LaCrosse, Wis.
9 BKV	Alfred W. Kruse, R. F. D. No. 2	Alcester, S. D.
9 BKW	J.A.Ostrand, Jr.,184 Arthur Av.,S.E	Minneapolis, Minn.
9 BKX	Victor H. Schleuder, 605 S. Wash. St.,	New Ulm, Minn.
9 BKY	Herbert Graham, 253 S. Locust St	Valparaiso, Ind.
9 BKZ	Robert A. Wolfe, Park Ave	Bradford, Ill.
9 BLA	David D. Jacobs, 1012 W. Church St	Champaign, Ill.
9 BLB	Virgil R. Ayer, 4322 Virginia Ave	Rosedale, Kan.
9 BLC	L.M.Clearwaters, 411 N.Salisbury St	W. Lafayette, Ind.
9 BLD	Fred W. Kinsey	McLean, Ill.
9 BLE	Joseph C. Blair, Jr., 601 Michigan Ave	Urbana, Ill.
9 BLF	Harold R. Reise, 1545 25th St	Rock Island, Ill.
9 BLG	Earl O. Jansson, 5868 Bartmer Ave	St. Louis, Mo.
9 BLH	Russel C. Smart, 104 Brown St	Columbus, Ind.
9 BLI	Robert E. Stanton, 227 Broadway	Denver, Colo.
9 BLJ	John Edward Lett, 1075 S. Emerson St	Denver, Colo.
9 BLK	George R. Underwood, 521 N. L St	College View, Neb.
9 BLL	Ogle Limon Hall, 707 S. Third St	Boonville, Ind.
9 BLM	Ray J. A. Lowden, 211 E. Seymour St	Muncie, Ind.
9 BLN	Clifford Bissman, 4832 N. Sawyer Ave	Chicago, Ill.
9 BLO	Joseph R. Tate	Dorrisville, Ill.
9 BLP	Leonard P. Miessen, R. R. No. 2	Hales Corners, Wis.
9 BLQ	Eugene Field Young, 155 S. Webster St	Decatur, Ill.
9 BLR	Theo. A. Johnson, 1018 Arkwright St	St. Paul, Minn.
9 BLS	Union High School, Madison Ave	Milton Junction, Wis.
9 BLT	Lawrence B. Smith, 418 N. 7th St	Osage, Ia.
9 BLU	Thomas B. Gibbs, 255 Pearl St	Winchester, Ill.
9 BLV	Harry L. Franc, Jr., 5414 Delmar Blvd	St. Louis, Mo.
9 BLW	Jack Jones, R.F.D. No. 2	Liberty, Mo.
9 BLX	Edward C. Meinholtz, 9812 Green Ave	St. Louis, Mo.
9 BLY	Lyoll K. Smith, 1714 Plymouth St	Minneapolis, Minn.
9 BLZ	Albin H. Carlson, 1426 A. 25th St	Ft. Dodge, Ia.
9 BMA	W. G. Peaslee, 2815 Central Ave	Minneapolis, Minn.
9 BMB	William Huber, 103 N. 14th St	Richmond, Ind.
9 BMC	Charles Wise, Box 402	Hopkins, Minn.
9 BMD	Hobert E. Stover, 124 13th St	Milwaukee, Wis.
9 BME	Jacob F. Hudlow, 21 S. 14th St	Kansas City, Mo.
9 BMF	W. Monfort Barr, 6 W. Delaware St	Knox, Ind.
9 BMG	Robert C. Sallenbeck, 1313 21st St	Des Moines, Ia.
9 BMH	Maurice Fletcher, 4308 University Ave	Des Moines, Ia.
9 BMI	Ralph Anderson, 1433 Mattern St	Des Moines, Ia.
9 BMJ	Theodore Graffunder, R.F.D. No. 1	Cottonwood, Minn.
9 BMK	George A. Renard, 4000 Hartford St	St. Louis, Mo.
9 BML	Charles Junn, 6154 S. Ashland Ave	Chicago, Ill.
9 BMM	Edward F. Fakter	Winnebago, Minn.
9 BMN	David T. Ferrier, Y.M.C.A	Sedalia, Mo.
9 BMO	F. D. Joesting, High Sch., Grove St	Owatonna, Minn.
9 BMP	Glenn Jacobs, 4324 Colfax St	Minneapolis, Minn.
9 BMQ	Otto Jilck, 1210 Summerville Ave	Monominee, Mich.
9 BMR	Florentine Rettig, 9th St	Breckenridge, Minn.
9 BMS	Ashley Williams	Aurora, Neb.
9 BMT	Albert E. Vick	Spring Grove, Minn.
9 BMU	Willie W. Wick, 300 Huron Ave	Sheboygen, Wis.
9 BMV	Leonard B. Moeller, Humboldt Ave	St. Paul, Minn.
9 BMW	Fred. L. Palmer, 211 S. 13th St	Independence, Kan.
9 BMX	Charles E. Knudsen, 782 Cramer St	Milwaukee, Wis.
9 BMY	Clement R. Robinson, 1437 Wisconsin St	Racine, Wis.
9 BMZ	Gervest R. Marsh, 1050 Buena Ave	Chicago, Ill.
9 BNA	Harvey H. Dezois, 335 S. Taylor Ave	Oak Park, Ill.
9 BNB	George J. Mueller, 590 Farwell Ave	Milwaukee, Wis.
9 BNC	Emil Bray, 1306 E. 19th St	Indianapolis, Ind.
9 BND	Don R. Selb, 3127 S. 4th Ave	Minneapolis, Minn.
9 BNE	Charles E. Nichols, 233 N. Main St	Tipton, Ind.
9 BNF	E.A.Schwegmann, 7401 Manchester Av	Maplewood, Mo.
9 BNG	Cyrus R. Truitt, Box 623	Novinger, Mo.
9 BEH	C. Christopherson, 1000 S. Phillips Av,	Sioux Falls, S. D.
9 BNI	Wm. B. Beemish, 2611 S. 3rd Ave	Minneapolis, Minn.
9 BNJ	Robert N. Flint, 1119 N. 8th St	Independence, Kan.
9 BNK	H.W.McKenzie, 2744 S. Blaisdell Av	Minneapolis, Minn.
9 BNL	Oreon K. Timm, 2635 Sutton St	Maplewood, Mo.
9 BNM	Alfred G. Diehl, 352 19th St	Milwaukee, Wis.
9 BNN	Rockford High School Wireless Club, S. Madison St.,	Rockford, Ill.
9 BNO	William E. Johnson, 315 N. Morgan St	Slater, Mo.
9 BNP	Walter G. Elle, 7506 Minnesota St	St. Louis, Mo.
9 BNQ	Theron A. Green, 126 N. Main St	Sycamore, Ill.
9 BNR	Kenneth Blakely, R. R. No. 3	Greentown, Ind.
9 BNS	Alfred E. Hasemann	Beecher, Ill.
9 BNT	Earl Atkison, 208 N. Locust St	Pana, Ill.
9 BNU	Bro. of St. Andrew, 318 E. 1st Ave	Ockaloosa, Ia.
9 BNV	Frederic O. Hall, 107 S. 6th Ave	Canton, Ill.
9 BNW	Boone National Bank, 812 8th St	Boone, Ia.
9 BNX	Henry J. Engelman	Orange City, Ia.
9 BNY	John Buffner, 1312 Willow Ave	Louisville, Ky.
9 BNZ	Leo Brough Welch, 115 West St	Waukegan, Ill.
9 BOA	Louis G. Stroh, 706 Constitution St	Emporia, Kan.
9 BOB	E. Young, Jr., 2290 Commonwealth Ave	St. Paul, Minn.
9 BOC	Cecil Calvin Clark, 624 Tonawanda	Rockwell City, Ia.
9 BOD	Edward J. Borman, 963 Tuxedo	Indianapolis, Ind.
9 BOE	B. C. Huckleberry, Jr., 511 N. East St	Lebanon, Ind.
9 BOF	Adolph L. Sahs	Salem, S. D.
9 BOG	Glen Acton Case, 3817 Carpenter St	Des Moines, Ia.
9 BOH	Charles D. Lawton, 216 Cooper Ave	Hancock, Mich.
9 BOI	Harris A. Smith	Blockton, Ia

9 BOJ James C. Hyde, 703 E. Hyde Park Ave..St. Joseph, Mo.
9 BOK Thomas C. Brown, 1203 E. 1st St......Duluth, Minn.
9 BOL Robert L. McIlvaine, 204 S. Goodwin Ave...Urbana, Ill.
9 BOM Orrie F. Sayles, R.F.D. No. 2..........Richmond, Ill.
9 BON Clarence H. Brown, 255 Main St......Valparaiso, Ind.
9 BOO John B. Wisenall, 9 Highway..........Covington, Ky.
9 BOP Theodore N. Rosser, 615 E. Pike St..Crawfordville, Ind.
9 GOQ N. Gilfred Garner, 211 E. Front St........Blair, Neb.
9 BOR Noel J. Lawson, 1202 Third Ave.......Aberdeen, S. D.
9 BOS Donald Stacy, Walnut & Sixth Sts..........Osage, Ia.
9 BOT Lee Kammeter, 912 Racine St..........Jefferson, Wis.
9 BOU James Eng, 250 Illinois St..............Chicago, Ill.
9 BOV Merrill J. Swenson, 417 S. 11th St..Minneapolis, Minn.
9 BOW Charles A. Swartz, 204 E. 5th St.....Concordia, Kan.
9 BOX Morgen L. Wood, 219 W. Union St......Waupaca, Wis.
9 BOY E. C. Knight, Box 20 ....Waupaca, Wis.
9 BOZ John K. Lowe, 3038 Montgall St.....Kansas City, Mo.

9 BPA Robert W. Carter, 405 Whitley St.........Joliet, Ill.
9 BPB Homer Ingram, 1430 S. 17th St.........Omaha, Neb.
9 BPC Victor H. Kansler, Citizens Bk. Bldg....Reedsburg, Wis.
9 BPD Darwin B. Apple, Main St...........Walkerton, Ind.
9 BPE Franklin Wingard, 635 W. 61st St.......Chicago, Ill.
9 BPF Walter C. Bucks, Elmwood ....Kendallville, Ind.
9 BPG Charles S. Daggy, R.F.D. No. 1.......Greencastle, Ind.
9 BPH Kermit C. Erickson, 2641 Pierce St..Minneapolis, Minn.
9 BPI Pearl Munden, 708 W. Jackson St.......Centerville, Ia.
9 BPJ Kenneth N. Mott, 208 N. 21st St......Richmond, Ind.
9 BPK Darrell Holt, 1345 Pennsylvania St.....Lawrence, Kan.
9 BPL A. C. Jorgensen, R.F.D. No. 1, Box 14..Waupaca, Wis.
9 BPM Ben C. Shilling ....Walton, Ind.
9 BPN Everett A. Reimers, 661 McLean St.....St. Paul, Minn.
9 BPO James Roy Burch ....Waggoner, Ill.
9 BPP Gerald Cunningham, 404 Tenth St.....Gibson City, Ill.
9 BPQ Raymond Laurent, Box 232 ....Clifton, Ill.
9 BPR Wayne Wilson, 1030 Ridge Ave..........Rockford, Ill.
9 BPS Earl N. Schnoor, 1342 W. Pleasant St...Davenport, Ia.
9 BPT R. E. Peterson, 3237 S. 18th Ave..Minneapolis, Minn.
9 BPU Eugene Nicholson, 2428 S. 42nd St.......Omaha, Neb.
9 BPV John R. Martin, 204 N. 1st St......Rockwell City, Ia.
9 BPW John G. Waggoner, 2701 Western Ave.....Mattoon, Ill.
9 BPX Howard Harrison, 432 N. Park St.......Lebanon, Ind.
9 BPY E. M. Van Duzee, Pillsbury Academy..Owatonna, Minn.
9 BPZ Joseph M. Brown, 17 Bond St..........Covington, Ky.

9 BQA Lee Ramsey, Jr., 757 Williams St........Denver, Colo.
9 BQB Robert H. Martin, 815 Cassopolis St......Elkhart, Ind.
9 BQC Charles L. Marvin, 770 Berrien St......Galesburg, Ill.
9 BQD Earl Hendrickson, R.F.D. No. 2.........Richmond, Ill.
9 BQE Walter T. Abraham, 614 Warren St......Davenport, Ia.
9 BQF Jack Musick Hunt, 3112 Woolworth Ave....Omaha, Neb.
9 BQG Kenneth E. Larson, 705 Berlin St.......Waupaca, Wis.
9 BQH David A. Dreyer, 406 N. Franklin St....Kirksville, Mo.
9 BQI Henry H. Taylor, 604 Judson St........Evanston, Ill.
9 BQJ Warren Knotts, 801 S. Race St..........Urbana, Ill.
9 BQK L. P. Rankin, 406 W. Normal Ave....Fort Hays, Kan.
9 BQL James W. Haddock, Elm & 9th Sts.........Hays, Kan.
9 BQM David M. Hedlund, 1953 Jackson Blvd....Chicago, Ill.
9 BQN Edgar M. Darby ....Russell, Kan.
9 BQO Clarence R. Shenberger, W. Grant St......Marengo, Ill.
9 BQP Jack Parham ....Hickman, Ky.
9 BQQ Delmar H. Hiebert, 4508 York Ave...Minneapolis, Minn.
9 BQR Harold Kenneth Fisher, 1801 Mulberry St..Muncie, Ind.
9 BQS A. J. Graves, 709 Douglas St..............Ames, Ia.
9 BQT William C. Cramer, 841 Wellington St....Chicago, Ill.
9 BQU Frank A. Miller, 616 Lincoln Ave......St. Paul, Minn.
9 BQV Ralph C. Stobie, 2249a S. Grand Ave....St. Louis, Mo.
9 BQW Orval Whisman, 1212 Preston St.........Rockford, Ill.
9 BQX J.H.DuBois, 1016 26th Ave. S. E...Minneapolis, Minn.
9 BQY Paul A. Masters, 110 S. 9th St..........Fargo, N. D.
9 BQZ Lucy V. Wilson, 327 W. 2nd St.........Ottumwa, Ia.

9 BRA Stuart D. Clayton, 159 E. 111th St......Chicago, Ill.
9 BRB Albert C. Baldwin ....Crete, Neb.
9 BRC Carl E. Swanson, 1176 Lincoln Ave.....St. Paul, Minn.
9 BRD Henry C. Harvey, R.F.D. No. 4..........Harvard, Ill.
9 BRE Alexander Maxwell, C-1 Park Apts.......Evanston, Ill.
9 BRF Harold E. Smithson, 628 1st Ave........Fargo, N. D.
9 BRG Clair L. Stong, 36 S. 10th St.....Minneapolis, Minn.
9 BRH John W. Schelen, 1031 Case St........St. Paul, Minn.
9 BRI Ellison D. Lynn ....Winner, S. D.
9 BRJ Rudolph Olson ....Sharon, N. D.
9 BRK Homer E. Ogden, 1518 Spring St.....Jeffersonville, Ind.
9 BRL Lyman E. Webb, 420 E. Main St.....New Albany, Ind.
9 BRM Ralph Reed, 315 5th St. S. E.......Watertown, S. D.
9 BRN William H. Myers, 91 Douglas St......Hammond, Ind.
9 BRO Lewis Hickox, 2123 E. State St.........Rockford, Ill.
9 BRP Howard B. Jennings, 2312 Western Ave....Mattoon, Ill.
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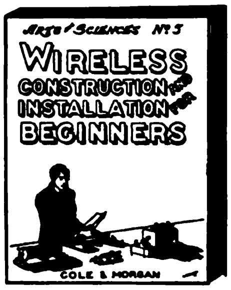
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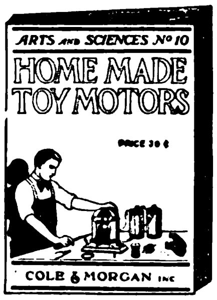

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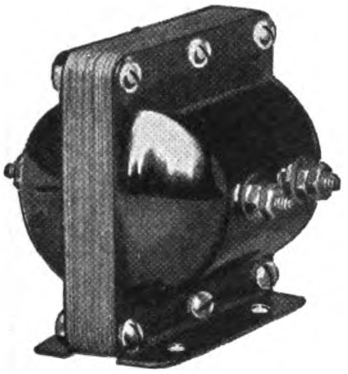

The CROSLEY SHELTRAN AUDIO FREQUENCY AMPLIFYING TRANSFORMER. High grade materials and excellent workmanship combine to give the CROSLEY SHELTRAN great efficiency and attractive appearance so often lacking, except in the most expensive transformers. Incorporated in the design of the SHELTRAN are all the characteristics necessary to obtain maximum amplification from the modern vacuum tubes. The ratio of turns is 9/1. The CROSLEY SHELTRAN has a base area of 1¼"x2½". Net weight 12½ ounces. The over-all length is 2½"; the over-all height is 2-7/16"; and the over-all width is 2-11/16".

Price, complete ready to mount—$4.00

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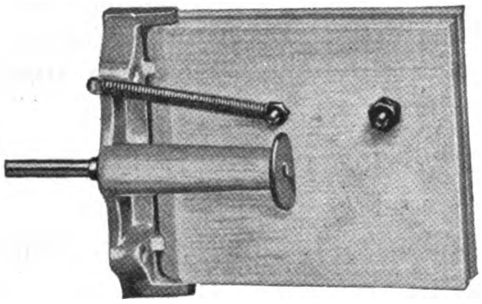

These condensers need no further introduction. They have been accepted by radio experts all over the country as being extremely efficient in all kinds of work. The Model "A" has a wood frame and the plates are high grade laminated wood. The Model "B" has die cast frame and best quality laminated wood plates. The Model "C" has die cast metal frame and porcelain plates and has a conservatively rated capacity of .001 MF. All CROSLEY CONDENSERS are tested under one thousand volts before shipment, and will not shower or break down in radio phone work.

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Model "A" without knob and dial	$1.25
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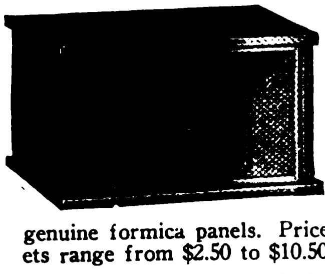
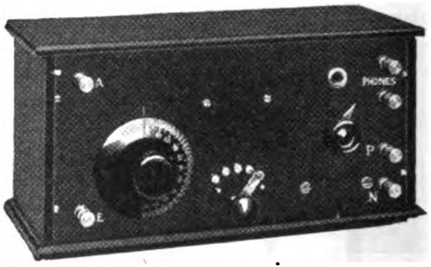
" "B" without knob and dial	1.75
" "B" with knob and dial	2.25
" "B" with knob and dial mounted in mahogany finished cabinet with binding posts	3.00
" "C" without knob and dial	2.25
" "C" with knob and dial	2.75
" "C" with knob and dial mounted in mahogany finished cabinet with binding posts	3.50
Crosley knobs and dials complete, each	.50

Crosley Cabinets



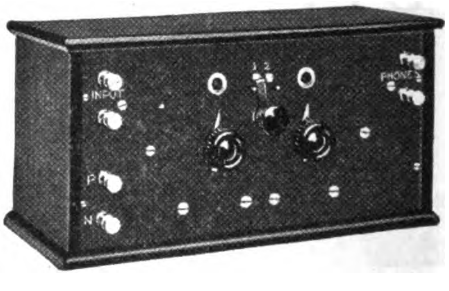
We manufacture a full line of cabinets in gum, mahogany or quartered oak, and furnish them with genuine formica panels. Prices on cabinets range from $2.50 to $10.50.

Harko Senior Radio Receiver



This instrument is a combination tuner and audion detector, and was developed to supply the demand for a low priced efficient receiving outfit with a range of 150 to over 600 meters. The hook-up is special—of our own design and is non-regenerative. New Jersey, Pittsburgh, Detroit and other phones are regularly copied in Cincinnati and other points, with this receiver. The HARKO SENIOR is 11½ inches wide, 6 inches high, and 4⅞ inches deep. Price, complete without "B" Battery, "A" Battery or phones—$20.00.

Crosley Two-Step Amplifier



This instrument was designed to give the very maximum in value and to match up with the Harko Senior, using the same sized cabinet. Complete with amplifying transformers, sockets, rheostat, switch, binding posts, etc., mounted on formica panel in mahogany finished cabinet. This efficient instrument can also be used with any other apparatus requiring two step amplifier. Price, complete as shown in illustration—$25.00.

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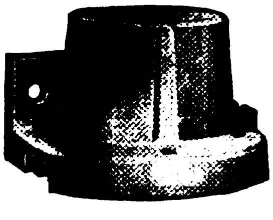

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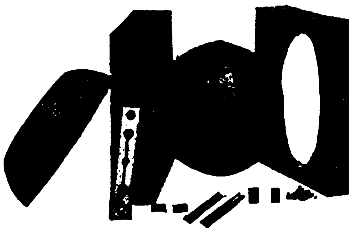
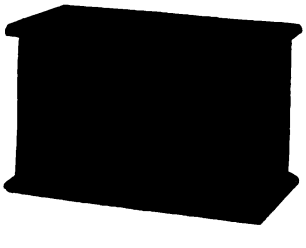


Consist of two stators, one rotor and the necessary hardware as shown in the illustration for complete assembling. Shaft for knob and dial is 3/16" diameter. Wood parts are furnished either in mahogany or poplar.

Price, complete, made of poplar wood	$1.50
Price, complete, made of mahogany wood	$1.75

Harko Radio Receiver



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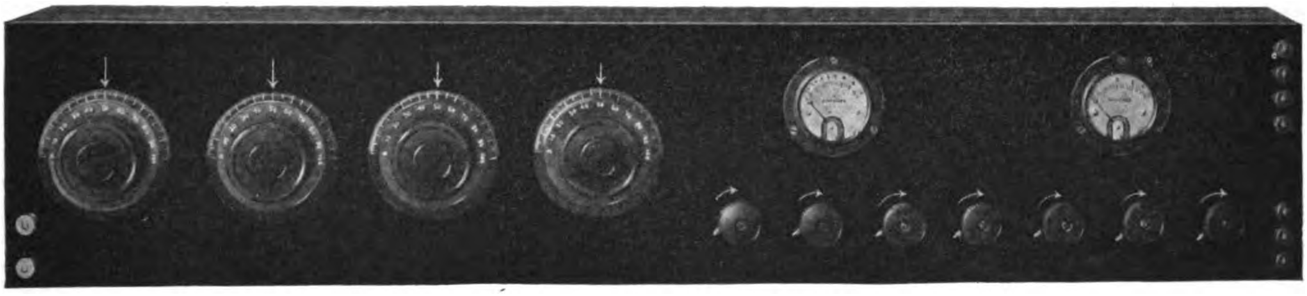

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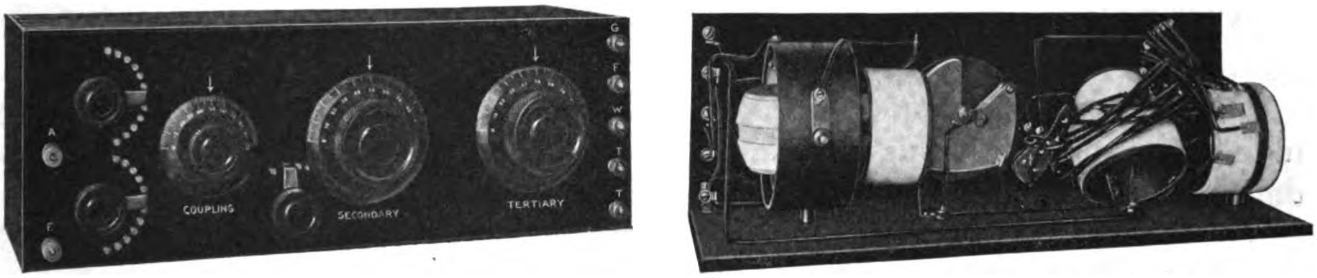

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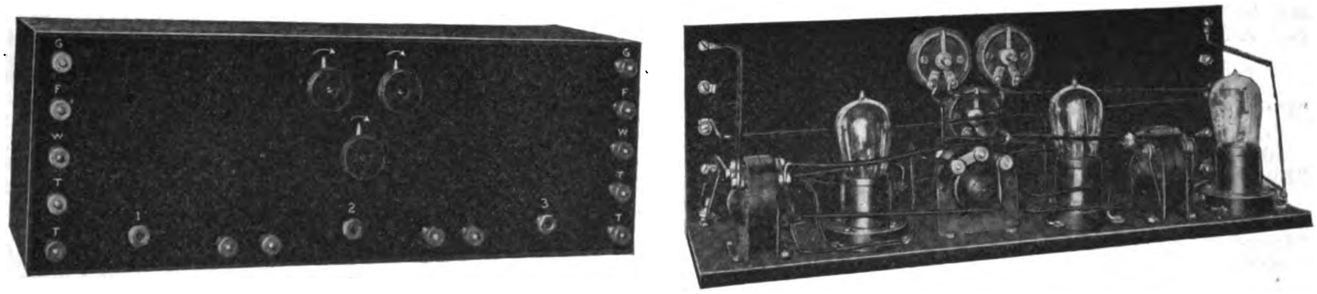

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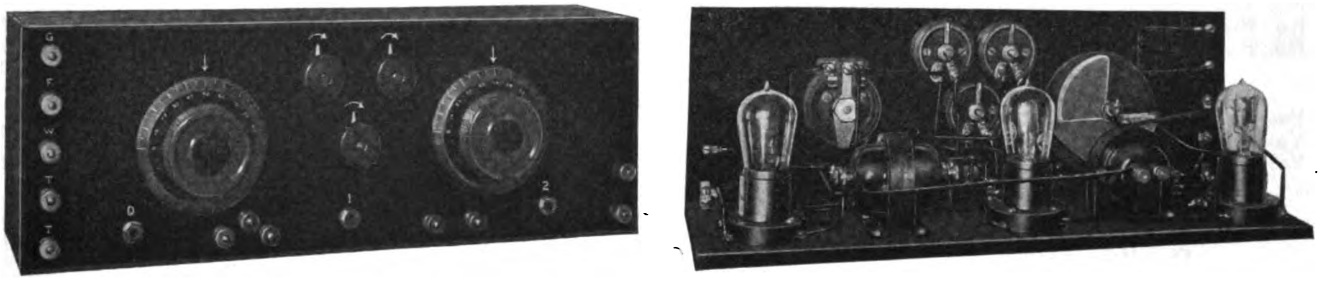

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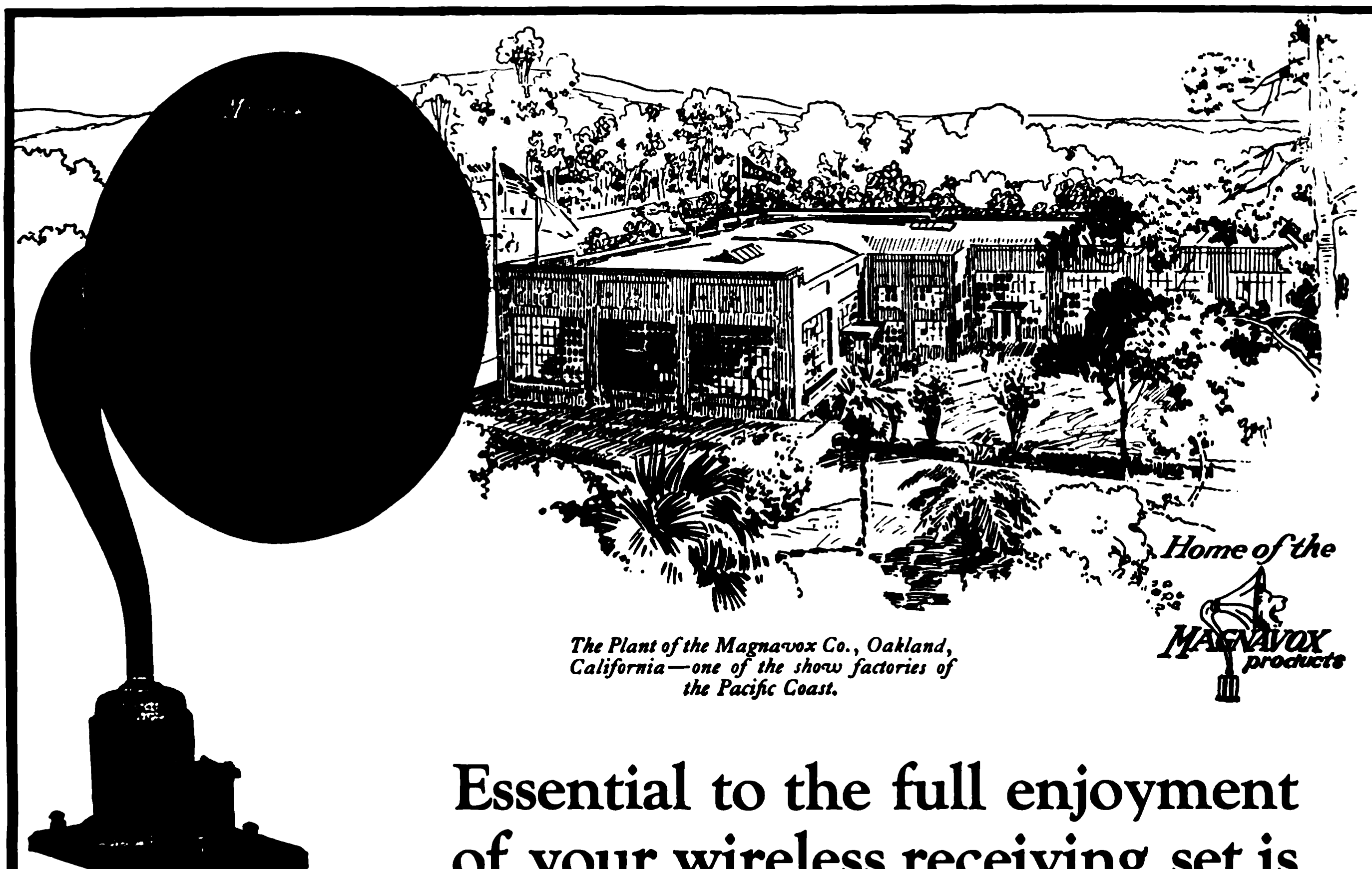

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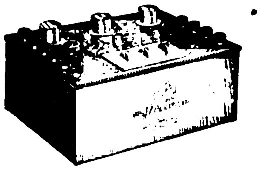

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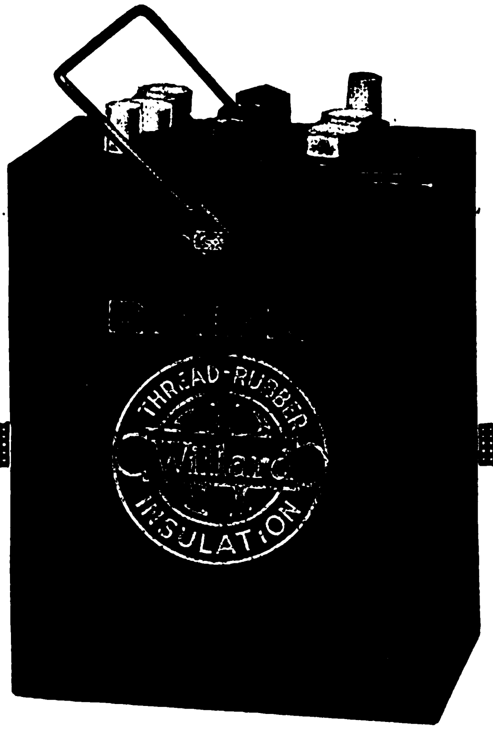

You'll have to admit it's annoying to have a radio concert or a conversation interrupted by noises that sound as if all the animals in the zoo had cut loose at once.

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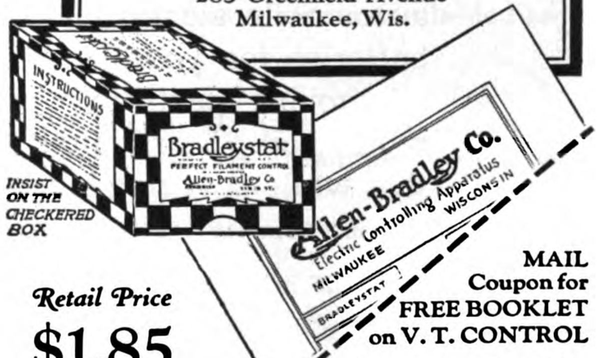

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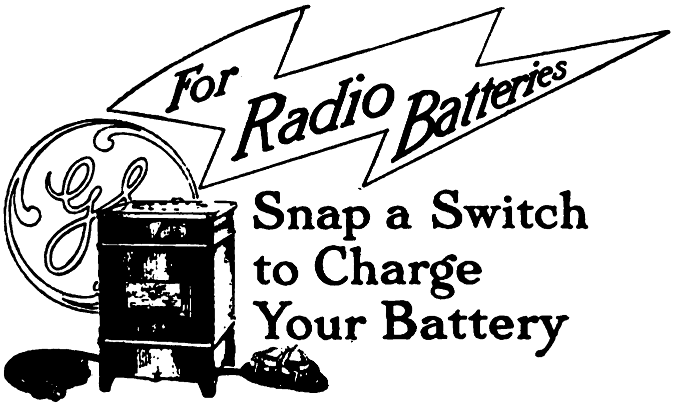

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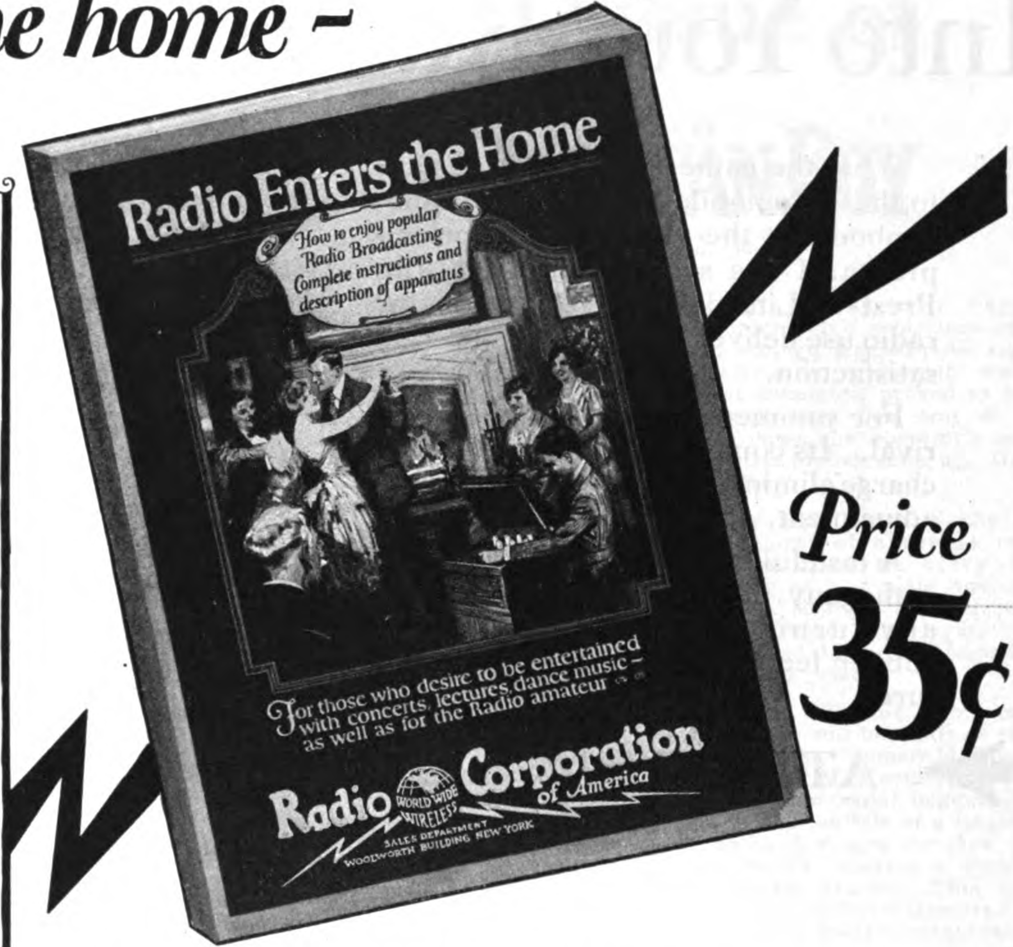
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The Prest-O-Lite is beyond question the foremost battery for radio use. Ask for it at any Prest-O-Lite Service Station; or your electrical dealer will get it for you. Prices $15.75 to $37.50.

We advise the selection of the battery of ample capacity to avoid frequent recharging. When it needs recharging, remember there is a Prest-O-Lite Service Station in your vicinity.

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➔ ATTENTION DEALERS! *Prest-O-Lite Batteries for Radio Equipment make the quickest moving stock to-day. Write for our proposition.*

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BATTERY
For Radio Use

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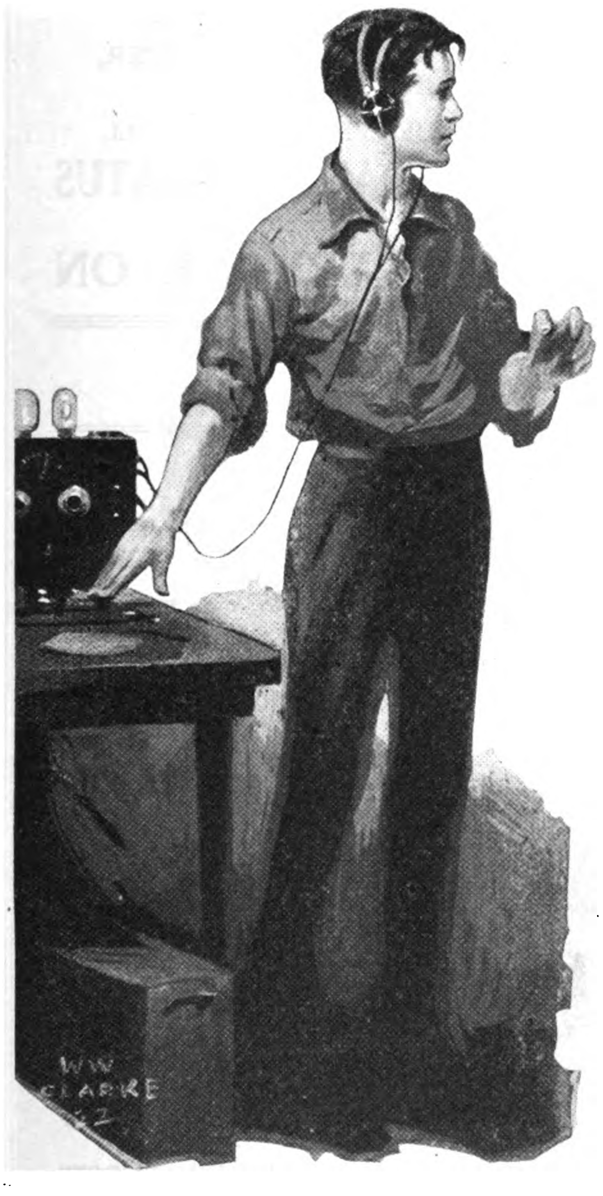
Tune up and listen in on the July special RADIO issue of

THE AMERICAN BOY

"The Biggest, Brightest and Best Magazine for Boys in All the World"



ALWAYS a step ahead in things that hold a live interest for progressive boys, THE AMERICAN BOY has made a feature of radio ever since radio has been practical. For months it has had a radio department under the editorship of Armstrong Perry, one of the foremost radio authorities of America. This has made THE AMERICAN BOY one of the leading magazines for authentic radio news and information. The most recent addition to our radio staff is Francis J. Andrews, radio instructor in the Aeronautical School at the University of Detroit. His articles will supplement those of Mr. Perry and he will answer radio questions asked by AMERICAN BOY readers.

So great is the clamor for reliable, easily understandable radio facts that the editors of THE AMERICAN BOY have decided to make July a special radio number.

In it you will find a great fund of radio information. You will find those facts that boys need to know in order to get the right start in radio. There is a wonderful article on radio construction that makes the building of a receiving set as easy as A B C. There are articles that tell you how to get the most satisfaction out of your radio set, both for yourself and others.

There is a "fact" story of a young fellow who, beginning with the simple experiments every boy tries, *used his brains* and became one of the most famous (and one of the richest) radio inventors in the whole world.

Good radio yarns are not new to AMERICAN BOY readers, but in July we will publish the best one we have seen yet, "The Devil Code," by Kenneth Payson Kempton. It's a mystery story of a strange, jangled radio signal received in mid-ocean which, when untangled, proved to be a code message that sent an icy chill down the operator's spine and made his hair stand up. Don't miss it!

July also contains the announcement of a special radio contest open to every boy whether he is a plain novice, a bug, an amateur or a licensed "op." Prizes and everything. Get in on this at the beginning and win a prize.

Besides all this good radio stuff there will be a raft of extra fine reading. "Tommy McTigue," by Charles M. Horton, is an absorbing new serial beginning in July. It's the tale of a tenement kid who discovers the clew to a plot which involves a gang of formidable crooks. This story will hold any boy's interest from the first to the last instalment.

There will be another fine "Advertising Andy" story—the climax to this great series. Laurie Y. Erskine contributes a bear of a yarn in "The Man Who Went Mad." Dhan Mukerji's story of his adventures with his elephant in India is continued, and there is another instalment of the pirate story.

"Jibby G. Washington Jones" is the title of a Fourth of July story by Ellis Parker Butler. You never heard of such a "Fourth." When you read it you will laugh your head off.

Tune in on this great July number of THE AMERICAN BOY. Get it for the great radio material. Get it for its many hours of fascinating reading.

The wave length is 20c at all news-stands, or $2.00 for a full year's subscription, delivered. Subscribe for a year or leave a standing order at your news-dealer's.

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Enclosed find $2.00, for which send THE AMERICAN BOY for one year, beginning with the current issue, to

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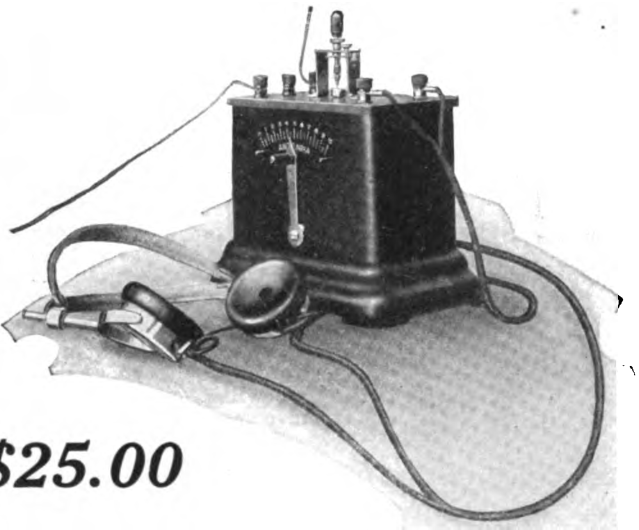
REQUIRES NO BATTERIES OR OTHER SOURCES OF POWER



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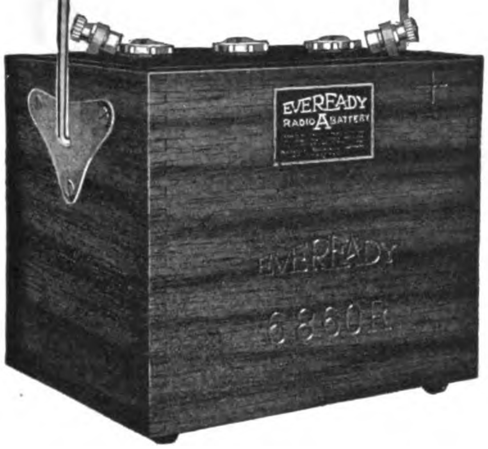

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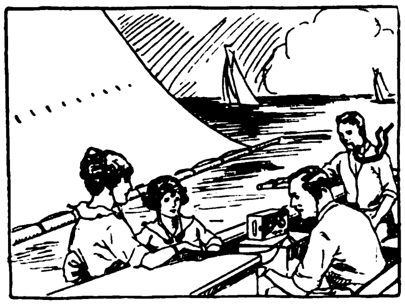

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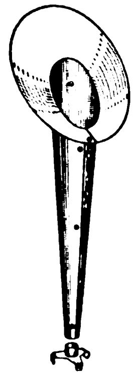

A Duplex Adaptor provides an excellent means for connecting both units of your headphones to a Lily Horn or other loud speaking device. Price $2.50

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In Our Opinion

The Radiophone Craze

WITH the advent of hot weather the people who want only a mysterious black box with a couple of knobs to turn are spending their time out of doors instead of listening to broadcasted programs. And many wise words are heard about the "end of the radiophone craze."

As a matter of fact, the passing of the faddish rush of the Winter and Spring is welcomed heartily. It gave publicity to the industry, but it also brought various evils in its train. Manufacturing equilibrium was upset and there sprang up a mushroom growth of inexperienced assemblers and retailers who thought they saw some cream to skim; a vicious circle of pyramided orders was built up that multiplied the actual consumer demand several times.

The Summer heat is boiling all these things down. The reliable manufacturers are getting a better scale of the market, they are catching up on back orders, and stocking their warehouses against the Fall business. The fly-by-night dealer is seeking cream in other pails. The industry as a whole is reaching a basis which, while much broader than it was a year ago, is firmer. The situation no longer is hectic, but healthy.

When the Fall arrives, and the radiophone once more becomes an indoor sport of the American public, the novices will find adequate stocks of dependable instruments awaiting them, improved broadcasting services at their command, and a capable dealer body anxious to aid them intelligently.

In the meantime, the amateurs, who for years have been the backbone of the industry and have contributed mightily to its progress, pursue their experimental way. While the industry enjoys a breathing spell they are discovering the great superiorities of C.W. transmission, and in receiving are developing radio-frequency hook-ups that keep out the static.

To the veterans, this is a great Summer!

* * *

The Super-Regenerative Receiver

JUDGING entirely by the results achieved by E. H. Armstrong in the recent demonstration of his new invention, the super-regenerative receiver, before the Institute of Radio Engineers this invention marks an important development of radio communication.

This new receiver—Armstrong's third important contribution to the art—is, in reality, a radio-frequency amplifier, its power of amplification increasing inversely as the square of the wavelength, or, in other words, the shorter the wavelength the greater the amplification it is possible to obtain. This one point in itself is specially interesting to amateurs, as heretofore devices for radio-frequency amplification have not worked with full efficiency on short wavelengths.

The really fascinating feature of the new invention, however, is its rejection of discontinuous waves, such as are emitted by a spark transmitter. The inherent characteristics of the new device are such that it automatically rejects all oscillations of "free" wavetrains, of the type set up with discontinuous radio-frequency by a closed oscillatory circuit acting on the open circuit of a transmitting station. Thus we approach close to the ideal in a receiver for radiophone reception; one that will cut out most of the interference from spark stations using code which has so often marred reception of broadcasted radiophone programs.

Red Tape and Taxes

OUR present radio laws and regulations, made ten years ago, are so obsolete as to be practically useless in their application to the immense development, particularly in radio telephony, which has taken place within the last two years. The need for more satisfactory and up-to-date laws and regulations was recognized some time ago by Herbert Hoover, Secretary of Commerce, and a convention of radio engineers, experts, representatives of several departments of the Government, engineering and amateur organizations was called at Washington.

The detailed report of this committee, earlier published in detail in THE WIRELESS AGE, assigned bands of wavelengths to various services, classified transmitting stations, and in general attempted to clear up what had been an unsatisfactory situation to all concerned. But revision of the existing radio law was found to be necessary before the new rules and regulations could be made effective.

To accomplish this a new bill to regulate radio communication, known as S-3694, has been introduced in the Senate by Senator F. B. Kellogg, of Minnesota. After two readings it was referred to the Senate Committee on Interstate Commerce.

The bill perhaps was well intentioned, but if enacted in its present form, promises a goodly addition to an already sufficient burden of red tape and taxes.

Just how the Secretary of Commerce is to carry out some of the provisions of this bill is not clear. How, for example, is he to determine whether anyone is "monopolizing, or seeking to monopolize" radio communication? He may revoke station licenses for this offense or intention, but many are likely to ask: What is a monopoly, anyway? The courts have frequently disagreed on the subject. Can a secret service organization, or other department of the Government, determine whether any individual or company is "seeking" a monopoly? Is protection of patent rights to be considered as constituting a monopoly, or fostering one?

Many will question the wisdom, too, of the provision by which autocratic power is vested in the Secretary to revoke any station license when he "shall deem such revocation to be in the public interest."

The bill also provides that the construction of a station can't be started until permission is given or a license is issued, and then if the station isn't ready for operation by a certain time the license is to be revoked. This is reminiscent of the trials of a public garage owner who was summoned to court by a fire inspector for having a wood floor on his garage, and who reported that the same wood floor had been installed by order of the Health Department to protect the workers from getting tiddle-de-winks from standing on cold concrete. Red tape!

And then we come to Section 9, and taxes.

Every type of transmitting station is to be assessed, from one engaged in trans-oceanic work to the attic type, consisting of a tin whistle and two dingbats. Now taxation may be necessary and advisable, but only if the revenue is to be applied to increased personnel for the inspection staff. The radio field would welcome such expansion, but if an already overworked radio staff is to be burdened with an excess of red tape, the good to be accomplished by an expanded staff would be negatived.

Drafted perhaps with the best intentions, the bill as it stands holds too much "Thou Shalt Not," instead of "Let's Go." —THE EDITOR.

Mme. Petrova Delves Into Future of "Radio Brain"

WILL the human mind develop to the point where it will be in itself a "radio" transmitting and receiving station? Read Olga Petrova's interesting theory expressed in an interview on page 39

Personality Survives Radio Wave, Says Opera Singer

IN an interview on page 41, Yvonne de Treville, coloratura soprano who has sung in many countries, tells her radio audience that the individuality of the singer or speaker is retained in voice transmission over the radiophone

She Explains the Secret of Success in Broadcasting

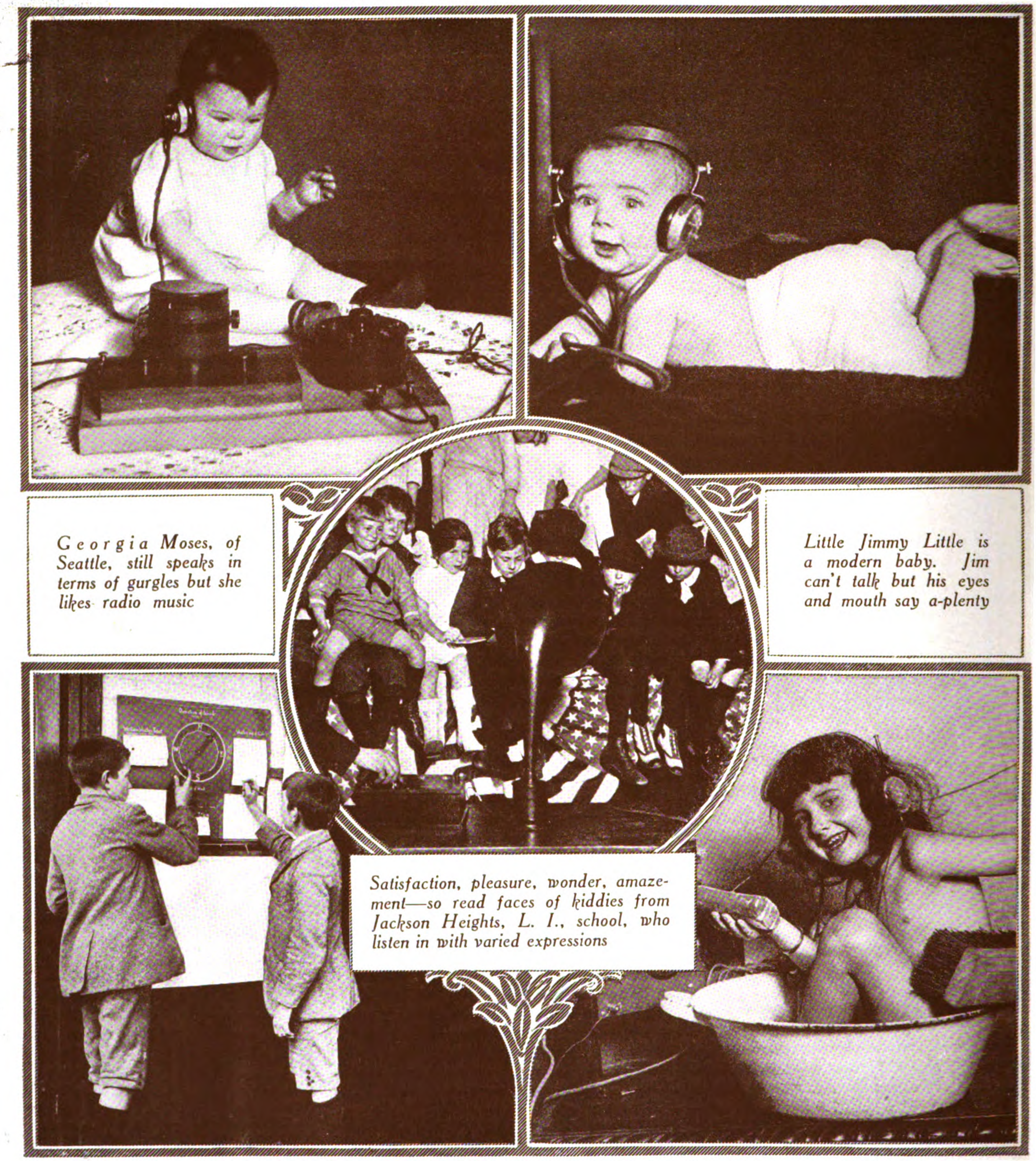
OLGA COOK, star of "Blossom Time," the Broadway success, reveals the method radio singers employ to "feel" the pulse of their unseen audiences. Her interesting explanation appears on page 31 in an exclusive interview which is enlightening

Google

Phonograph "Rube" Character Speaks to Radio Fans

BYRON G. HARLAN, character singer, in a short time has become as popular with radio fans as he has been for twenty years with phonograph enthusiasts. On page 45 Mr. Harlan declares he believes radio is a force for good sent down from Heaven and is here to stay

Children's Hour These Days Is the Radio Hour



Georgia Moses, of Seattle, still speaks in terms of gurgles but she likes radio music

Little Jimmy Little is a modern baby. Jim can't talk but his eyes and mouth say a-plenty

Satisfaction, pleasure, wonder, amazement—so read faces of kiddies from Jackson Heights, L. I., school, who listen in with varied expressions

A scene common in schools throughout the country. These lads are visualizing weather reports received by wireless telephone. Educators predict radio will do important work in the development of children

Little Peggy Rice, four years old, listens in to a radio concert while taking her daily bath. And take it from Peggy, radio adds greatly to the enjoyment (?) of children's baths—as her happy face will testify

Nothing Would Seem to Be Impossible in Radio

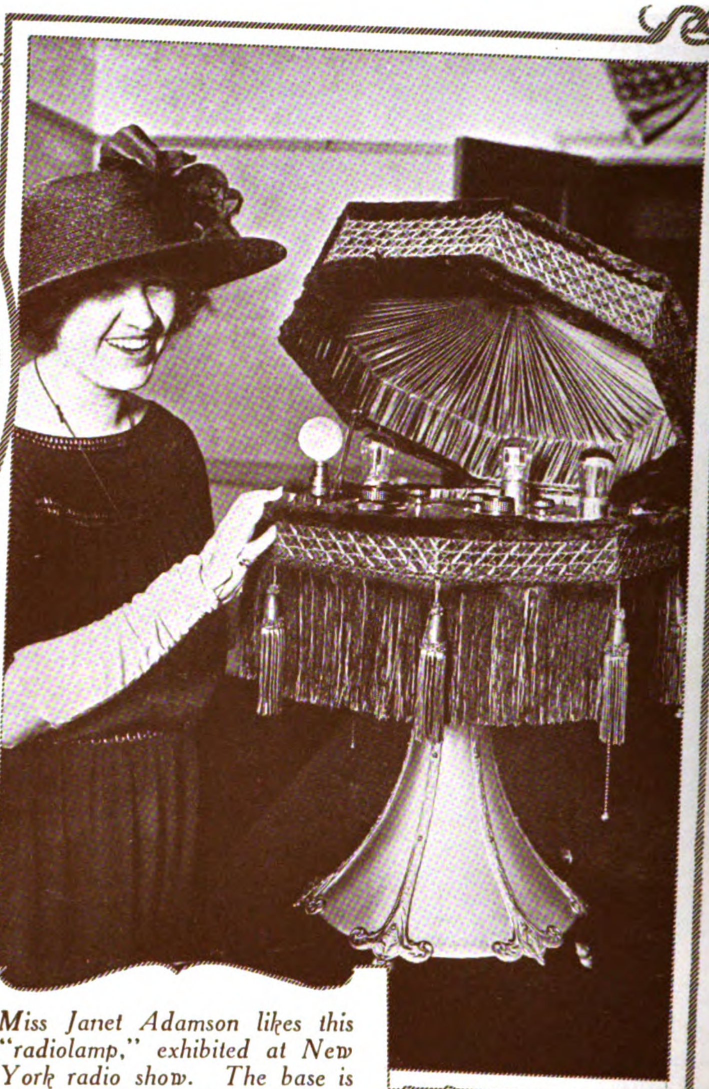
Reta Pam might have difficulty, between holes on the links, in catching music with this set-up

June found Miss Mildred Fenn (top) and Mildred Redmond erecting an antenna on their motor boat

Here is Jack Hoxie and his wireless telephone for horseback riding. No startling results have been claimed, but it indicates the radio rage has reached the cattle ranges

Novelties Reveal Radio Monkeys and Radio Teas

At least Jimmy realizes the phones aren't attached to the feet—which is one comfort



Miss Janet Adamson likes this "radiolamp," exhibited at New York radio show. The base is a tone horn; shade covers receiving set and electric light

One of the novelties at the recent New York City radio show was a necklace containing a crystal receiving set. Miss Winifred Miller is shown wearing it

Radio helps digest the food, so they say. At least a set was recently erected in Tea Room of famous Waldorf-Astoria Hotel, New York. A midafternoon refreshment scene

More Notable Stage and Screen Radio Victims

Mme. Asta Souvorina, "The Bernhardt of Russia," listening in with "Buster" on receiver made by her two sons, Andrew and Nicholas

And Dick Bartelmess, movie star, decides at the studios he wants the correct time, so he tunes in for Arlington and sets his watch

Mary Pickford, "out on location" keeps in touch with the studio, and maybe with "Doug" Fairbanks, her jovial husband. The photo above shows Mary as the famous "Tess." Motion picture officials claim this communication from the studio to companies on location saves thousands of dollars worth of valuable time and eliminates many delays. Supplies are ordered in this way and instructions given. At the time this was taken "Doug" was filming "Robin Hood," miles away

Debate by Radio

"RADIO telephony is of more permanent value as a means of entertainment than for sending messages of general commercial use."

That was the decision of judges in the first debate conducted by radio in the Northwest. By a 2 to 1 vote the judges gave the verdict to the North High School debating team of Minneapolis, over the Johnson High School team of St. Paul.

On the Minneapolis team were Margaret McCaslin, William Boyer and Berryl Bearman, while Bernese Kern, Alvin Hilgedick and Elmer Noreen represented Johnson high school. Judges in the debate were Dr. Samuel F. Kerfoot, president of Hamline University; Mayor George E. Leach of Minneapolis, and W. I. Nonal, Speaker of the House of Representatives.

To Broadcast Movies?

PYRAMID PICTURES, INC., has contracted for the installation of a broadcasting station at its plant in Astoria, L. I., N. Y., and expects to have the station in operation in the near future. The exact manner in which it will be used has not been stated, but the close connection that the company has with the film distributors and the theatres has led to the supposition that loud speaker sets in the motion picture houses may be planned, to link the producer directly with the audiences in many houses. This would enable the stars in feature pictures to "appear" simultaneously in hundreds of theatres where their pictures were being shown.

Police Tests In Chicago

EXPERIMENTS in the use of radio in the transmission of police messages in Chicago have proved a complete success, George B. Carlson, Commissioner of Electricity, says in requesting an appropriation of $68,000 for radio equipment and personnel.

If granted the appropriation a new duplicate sending station will be installed on top of the City Hall. The eight high-powered bandit cars used by the Detective Bureau will be equipped with both sending and receiving sets.

"I think the equipment of the bureau cars with radio sets will prove an important factor in arresting criminals." Chief Fitzmorris said. "I doubt whether radio development is sufficient to warrant its use by ordinary patrolmen, however."

Aid To Builders

REAL estate subdividers find that the use of the radio promises to become an indispensable adjunct to their activities, according to a prominent subdivider and home builder of Los Angeles, who has just installed a radio system at his main office and is now in constant touch with the activities of his tracts.

Under the plan which he has adopted to use the radio, he receives every day at the close of business a comprehensive report from his managers.

He finds, moreover, that by receiving these radio reports after the hours of the business day and before the Los Angeles newspapers start their evening radio concerts, that the air is virtually free from conditions which interfere with the transmission of this business.

At both Walnut Park and West Adams Place, the Girard organization is engaged in extensive building operations which will keep a large force of men engaged throughout the summer.

"Stop, Look and Listen!"

IN connection with the national "careful crossing" campaign, conducted under the auspices of the American Railway Association, which started in June and will continue through September, a message, of which the following is an extract, was broadcast from KDKA, WJZ, WBY, and KYW:

"Under the direction of the American Railway Association, all railroads of the United States are taking part in a national careful crossing campaign.

"The object of the campaign is to bring to the attention of the American people, in an impressive manner, the necessity for exercising the greatest possible care to avoid being struck and killed or injured by trains while traveling over highway crossings.

"In the past five years 9,000 deaths and 24,000 injuries have occurred at highway crossings, while in 1921 alone thirty out of every 100 accidental deaths on railroads of the United States were classified as crossing accidents."

The message had a tremendously wide circulation, as many newspapers, catching the words from the air, reproduced them and no section of the country was left "uncovered."

Well, well, well! The Radio Shoeshine! Shoes are not shined by wireless but the patrons of this Oakland, Cal. bootblack hear radio music while he works

Radio Aids Surgical Patient

THE radio telephone and spinal anaesthesia together took a young girl through two dangerous operations recently at the Samaritan Hospital in Philadelphia. It was impossible to give the patient ether, so an injection into her spine was used to numb her body from the shoulders down. In order to distract her attention from the operation and give her mind a healthy tonic during the forty-five minutes she spent on the operating table, the head phones of a radio receiving set were placed over her ears, and she listened to the art of great musicians as transmitted by radio. While Dr. Frick excised her appendix and removed several large gall stones, the patient displayed great interest in the broadcast program, oblivious of the surgeon.

Only 15 Silent States

CALIFORNIA so far leads the country in the number of broadcasting stations. She now has 37 stations; Ohio comes next, and Pennsylvania and New York are close behind, according to a study made by the National Geographic Society. Only 15 states are without broadcasting stations, these being North and South Dakota, Arizona, Nevada, Utah, Wyoming, Idaho, Montana, Florida, Mississippi, South Carolina, Kentucky, Rhode Island, Vermont and New Hampshire. All these states, of course, listen to broadcast matter from many others, so that there is no part of the country in which it is not possible to listen in to radiophone concerts.

New City Stations

CHICAGO, not to be outdone by New York City, is to have a city broadcasting station, which will be erected on the Municipal Pier. Receiving equipment with powerful amplifiers also will be installed, so that the pier, which is used throughout the year for conventions, will be able to entertain those who are on it as well as those at a distance.

Richmond, Va., has started to experiment with receiving apparatus, in order to train its policemen and firemen in radio. As soon as the necessary experimental and educational work has been done, transmitting apparatus is to be installed, and portable receivers placed in the hands of the police.

Justice Taft Uses Radio

CHIEF JUSTICE TAFT delivered a speech on June 2nd by radio to the Associated Western Yale Clubs, on the occasion of their holding their seventeenth annual meeting in Detroit. The speech was broadcast from the Arlington station at 9 o'clock, Eastern standard time, on a wave length of 2,650 meters.

Radio's Important Place In The Work Of

Americanization

General Robert Olyphant, President, Sons of Revolution, Explains Its Possibilities

Robert Olyphant

"THE radio telephone will bring the English language and American ideals to those foreign-speaking sections of our large cities that now offer so great a problem in Americanization work."

Such is the opinion of Robert Olyphant, president of the Sons of the Revolution, which has been taking a large part in educating the foreign-born to become truly American in spirit.

"We have here many groups of foreign born citizens," said General Olyphant. "They come from almost every spot in the world. So that this country resembles a veritable Tower of Babel as far as language is concerned. These groups, when they come to this country generally settle down in a particular place.

"Those who follow, of the same group, invariably go to the same city and even to the same section of the city that has already been populated by people of the same race. New York holds a splendid example of this. We have entire sections peopled by those of different nationalities. Spaniards, French, Russians and many others live apart and when they speak to each other, they do so in their mother tongue. They read newspapers and books printed in the language of the country in which they were born.

Removal of Language Barrier

"At heart they are Americans and I do not mean to give the impression that I regard the settling together by these various peoples as at all undesirable. The point I do want to make is that the work of Americanization, and this includes the teaching of the American language to these people, is a task which becomes increasingly difficult in view of their keeping together and speaking and reading not in the English language.

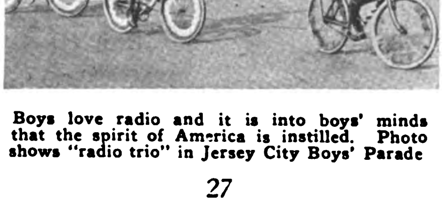
"The radio telephone in my opinion," continued the General, "will penetrate this almost impossible barrier. The voice speaking the English language and the voice propagating the American ideals and literature will go into the homes of these foreign born citizens. They will be listening to the wireless voice and benefiting by it, whether they want to or not.

"Our organization was formed to promote and assist in the proper celebration of the anniversaries of Washington's Birthday, the Battles of Lexington and Bunker Hill, the Fourth of July, the Capitulations of and the Evacuation of New York by the British army and other prominent events relating to or connected with the war of the American Revolution.

Right Material Vital

"The radio telephone will do an important work in Americanization only if it carries the messages that assist in bringing home to the people the importance of this work. It all depends on what is transmitted.

"The objects for which our organization stand are sacred to this country, and if the radio telephone can help to impress upon the many millions the sacredness of them, then in my opinion the radio telephone will perform a service to America that will be invaluable.


Boys love radio and it is into boys' minds that the spirit of America is instilled. Photo shows "radio trio" in Jersey City Boys' Parade

"The radio telephone of course will play a very great part in patriotic demonstrations of the future. Consider, for instance, the celebration that we had recently in the City Hall Park, New York City, where we re-dedicated the statue of Nathan Hale which we gave to the city in 1897. I have no doubt but that in the future radio will be developed to such a point that a message given at that demonstration would be heard not only by those attending the affair but also the words will reach the ears of those hundreds of thousands scattered within a radius of several hundred miles.

"It is during the month of July especially that the work of patriotic societies comes to the attention of the public. The greatest American holiday, the Fourth of July, commemorating the birth of our free Republic, seems to give this nation a new lease on life and a new appreciation of the things for which America stands.

"This year also there is a new note added in the general scheme of things that goes to promote the well-being of America. The radiophone has been accepted by the public.

A National Blessing

"In every part of the country where patriotic gatherings had a place, the message of the speakers, pointing out the story of America, went out through the air and into hundreds of thousands of homes—homes of the American born as well as those to whom this land is an adopted choice. Therefore the lessons of patriotism that are sent out this year will have a far greater influence than any that were ever sent out before, in that they will reach farther and in that way come to the attention of more people. It is a national blessing that such an astounding feat is possible and it means a step forward in the progress of America and Americanization programs."

Such were the opinions of Robert Olyphant, President of the Sons of the Revolution.

Knights of Columbus Mission

MAKING missions by wireless is the latest radio achievement. Under the auspices of the Knights of Columbus, the second successful experiment in holding a large, general mission and broadcasting the lectures delivered at the mission has been concluded in Seattle. The first experiment was made in Pittsburgh.

From St. James Cathedral in Seattle, through a transmitting instrument placed in the pulpit, the missionaries were enabled to reach many hundreds of people in various parts of Washington and neighboring States who could not attend the mission.

The success of the mission has made it probable that K. of C. councils in all large cities will adopt the radio. Already many K. of C. councils have conducted full evening vocal and orchestral entertainments by radio.

It is probable, too, that the elements of radio telephony and telegraphy that can be taught by mail will be added to the curriculum of the K. of C. National Correspondence School in New Haven, Conn.

Radio for Health Service

WIRELESS telephony has been enlisted in the service of public health by Dr. Huntington Williams, who was a member of the first class formed at the Johns Hopkins School of Hygiene and Public Health. Dr. Williams is a sanitary supervisor in the New York State Department of Health.

When the wave of popular interest in radio swept the country a short time ago Dr. Williams recognized its possibilities as a medium for the dissemination of health instruction. He made arrangements by which his department broadcasts information of health topics every week in five-minute "talks."

Dr. Williams estimated that the talks are heard by at least 10,000 persons in cities and rural sections of New York State. They also have been received in California and Cuba, and have elicited replies from many points, including Baltimore.

The talks are prepared by officials of the department in popular form and on such subjects as keeping well, tuberculosis prevention and child hygiene. The General Electric broadcasting station sends out the talks as a public service, Dr. Williams said.

Arrangements have been made by which, in emergency, radio facilities will be thrown open to the department that will permit it to communicate with any part of the country. Dr. Williams believes this will be of great value in such a situation as that arising from the flood at Albany in 1913, when pollution of a huge water supply system caused an outbreak of typhoid.

To Help Pass Time

ANOTHER new use for radio has been discovered by an enterprising theatrical manager in Los Angeles.

The New Mission is the first Los Angeles theater to use the radio service, or any radio, as a means of entertaining patrons waiting in the lobbies for admission to theater auditoriums.

The patrons were delighted with the innovation, and they found waiting in the lobby such an entertaining part of the show that the management intends to give the radio concerts from the stage.

This photo shows players in a billiard hall getting hints on how to improve their game. A lecture on "How to play billiards correctly" is coming over

Pain, Get Thee Hence!

THE greatest substitute for laughing gas ever invented is the way dentists describe the very latest in radio devices.

The more disagreeable features of dentistry, the dizzy burr of the grinder, the sharp twinge of the probe, and other unpleasant things, are now relegated to the limbo of the past by means of a radio receiving set placed next to the dentist's chair.

Dentists claim that a little light music while teeth are being "fixed" helps greatly to relieve the pain and unpleasantness by taking the mind of the patient off his troubles. Anyway it serves to lessen greatly the monotony of long, tedious hours in the dentist's chair.

Yuletide Gifts Next Year

"THE Radio Corporation of America has established a great warehouse in Chicago and has allocated 40 per cent. of its entire output to the western territory," said J. C. Davidson of Hendrie & Bolthoff on the occasion of a reconnaisance of Eastern radio markets. Mr. Davidson is in charge of the electrical and radio departments of that big Denver jobbing house and visited Boston, New York, Philadelphia and Chicago.

"Future deliveries of parts and complete radio sets will be on a normal basis within sixty days," continued Mr. Davidson. "Many of the factories are working twenty-four hours and most of them have already enlarged their floor space to three and fourfold of former size.

"The Radio Corporation will be shipping its back orders within two months. Dealers thruout the East are preparing for an enormous fall trade. They are anticipating a most unusual Christmas business and believe that radio sets will constitute a very large proportion of the presents made by parents to boys and girls next yuletide."

Radio for River Boats

PASSENGERS traveling between Baltimore and Norfolk on the steamers of the Baltimore Steam Packet Company will soon be entertained by radiophone concerts. Preparations are being made to install wireless telephone outfits on the Old Bay Line boats.

To test the plan, a radio apparatus was placed on the Steamer *Florida*. As yet, however, it is impossible to hear any of the broadcasting stations distinctly. Programs broadcasted from Station KDKA, at East Pittsburgh, Pa., have been heard, but not distinctly. Joseph H. Delano, superintendent of the Old Bay Line, said that attempts were being made to remedy the defects so that the broadcasting stations could be heard clearly.

Radio Blesses the Lives of the Blind

Blind People in All Parts of the Country Are Benefited by the Wireless Telephone—Instruction and Entertainment Obtainable in No Other Way—Society's Greatest Gift to the Sightless

By Ward Seeley

> **OF the blind much has been written. Their misfortunes and their sorrows, their struggles and their attainments, their fortitude and their heroism have all received commentary. At the story of those who sit in darkness, of the lot which they endure, and of the things which they have overcome, a sigh of compassion has arisen to many a lip, a tear of sympathy to many an eye, a glow of admiring pride to many a cheek. It is perhaps well that this should be. The deprivation of sight is verily a grievous one—one to which mayhap none other befalling the sons of men is to be likened. That commiseration for the state of the blind should so widely be evolved in the breasts of their fellow creatures is a tribute for the great heart of humanity.—from "The Blind," by Harry Best, Ph. D.**

THE lot of the blind in history has been ever sad. The most that they could expect was pity; neglect was usual up until very recent times; in the ancient world, cruelty toward them was not unusual, and it was not until the coming of Christianity that charity began to be shown to those bereft of sight, the first institutions for the blind having been erected in the Fourth Century A.D. by St. Basil at Caesarea in Cappadocia. Today, the coming of the latest marvel of science, the radiophone, promises to be the greatest blessing of the centuries since Christianity brought compassion into the heart of Rome.

By means of the radio telephone the world is brought to the blind as it never has been before. Radio receiving apparatus to a blind person is at once education and recreation; it is intellectual meat and drink; it brings to the blind the musician, the preacher, the lecturer, the news; it is to the sightless the newspaper, the book, the theater, the opera and concert, the church, and the lecture platform. Not one per cent. of the blind have ever enjoyed save spasmodically and occasionally the benefits of these things that sighted people take as a matter of course. A blind person must be unusually gifted, insensitive to either public pity or annoyance, and amply financed if he or she is to take advantage of the resources of modern society. Only the newest of those resources, radio, brings easily within the ken of the blind all that can be represented by the spoken word or musical sound.

There are now 52,617 blind persons in the United States, according to the U. S. Census of 1920. This figure shows a ratio of 49.8 per 100,000 of population. The census tabulation shows 30,199 male blind, 22,418 female; 45,783 white, 6,306 negro, and 488 Indian.

These figures are considered by authorities on the blind to be greatly in error. Large inaccuracies have crept into the census in regard to the blind, due to the reluctance of many families to report to the census takers, and to the carelessness of these latter, few of whom made the specific inquiry, "Are there any blind persons in the family?" A measure of the error is afforded by the New York State Commission for the Blind, which found, through painstaking survey, 10,982 blind persons in New York State, while the Census total for that state is only 4,205. If that proportion holds in the other states, and there appears no reason why it should not, the number of sightless persons in the United States must be in the neighborhood of 104,000, or about 100 per 100,000 population.

Society's attitude toward these people is one of compassion. Society's action toward these people is to provide education for them, more or less haphazardly, and to give them alms indiscriminately. The blind traditionally have been beggars through the centuries, and today many of them, if not most, still stand with outstretched hands for the coins that mean so little compared to the great wealth of the world now passing through their very bodies in radio waves.

Those who are born blind, it is true, now have great care taken of them in many of the states, being placed in institutions where they are taught minor trades, and instructed in such elementary school subjects as the schools may decide it is feasible to teach. One or more of the embossed type reading systems of course is essential.

It is after the children are old enough to leave their school and return to their homes that the great time of testing and trial of the blind comes. In many cases the want of sight creates a situation beyond the power of the blind to meet. The family, often ashamed of its afflicted member, is inclined to neglect to give more than the barely essential care. Such things as reading aloud of books or newspapers seem too great a burden to the sighted. Leading the blind abroad for walks or to attend the theater, concerts or lectures, is distasteful.

Only those blind who can afford to employ a nurse can be assured of a limited freedom of movement and a flow of intellectual stimulus. The majority are condemned to dependency, distress and want. In the instances where they have been taught a trade,

Charles Burrows, blind Civil War veteran, listens happily at his receiving set. He posed for this picture especially for THE WIRELESS AGE, in token of his gratitude to radio

usually their earnings are so small as to be barely sufficient for food and clothing. Probably the blind who tramp the streets, begging with little trays of chewing gum and shoestrings, are financially better off than most, but they are far in the minority. Most blind people are either in institutions, or in homes from which they seldom step.

The greater part of the blind population is old. Most blindness is an affliction of old age, and 65 per cent. of the sightless are too old to learn a trade or even a useful occupation. Thousands of old blind men and women sit rocking from morning to night with nothing to do, waiting for time to pass, patient sufferers from a fate earned solely by living to an advanced age.

The problem afforded by this large body of the blind of all ages attracted attention early. In nearly every case the efforts made were aimed at making the sightless more self-supporting and less dependent, more contented and less pitiable, more intelligent and less ignorant.

Obviously the first manner of instructing the blind is by personal instruction, including reading aloud. This, however, can be had only by those able to employ readers and instructors specially trained in working with the blind. The great necessity for the blind was a means of reading, of doing without personal service. Raised or embossed type for this purpose was first invented in Spain in 1517 and went through many modifications until the present several blind alphabets in raised type were evolved, known as American Braille, English Braille, New York Point, Line letters, and Moon system. When alphabets of this kind became practical and instruction was given in them to blind persons, their greatest handicap became apparent, namely, their expense. A book printed in type for the blind will cost from five to ten times as much as the same book in ink type, and it will be three or four times as bulky. Therefore, but few blind persons can own libraries, and must depend on the circulating libraries of the institutions and the large public libraries.

In addition, there are several magazines printed for the blind, the leading one being the "Matilda Ziegler Magazine for the Blind," printed monthly in New York City on an endowed press and distributed free of charge. The edition is 9,000 copies, or approximately one-tenth of the number of blind persons, but as many copies go to institutions and libraries, probably the "Ziegler Magazine" reaches the majority of the American blind.

These books and magazines are considered so important by the authorities that they are carried through the mails free of postage.

In speaking of the "Ziegler Magazine," the American Encyclopedia of Ophthalmology says: "During this century no single effort in behalf of the blind has brought so much happiness to those who spend their lives in darkness."

Probably that verdict will have to be revised as radio spreads its benefits among the blind. Walter G. Holmes, editor of the Ziegler Magazine, said in a recent issue: "I believe that the time is coming, and not in the far distant future, when by the use of radio the blind will sit in their homes in any part of the country and hear news of the day at a certain hour, music at a certain hour, and a book read at a certain hour. A number of these radiophones are in constant use in various parts of the country." After explaining briefly the installation of a set and the difficulties due to interference, static, and—to the average sightless person—the high price, these cheering words are added: "We suggest that our readers just be patient, and as developments occur we will keep them informed and let them know just as soon as the instruments are in practical use and within the reach of all. I believe that in time each community will feel that it should take an interest in helping the blind residents to secure one of these instruments."

Pioneer work in wireless for the blind was done in this class in September, 1921, when blind boys were taught the code and received broadcast press messages

The major difficulty of furnishing radio for the blind is the cost. The majority of the blind are impecunious, and the institutions in which some of them work or live likewise are struggling. Nevertheless, many sightless men and women today are living as they never lived before the radio telephone became a reality.

Charles Burrows, a Civil War veteran and a leader in the fast-disappearing G.A.R., has a receiving set, and recently, when William Wade Henshaw sang at WJZ wrote the following letter:

> "As one of the vast audience which listened to the 'Impresario' last evening I gladly accept your invitation to let you know something of my impressions.
>
> "I could hear everything distinctly and with so great a pleasure that I was frequently tempted to join the applause, forgetting for the moment that I was more than eight miles distant. It needed only the sight of the artists to complete one's enjoyment. That enjoyment I cannot have by reason of blindness, but thanks to the radio apparatus I have had the pleasure of hearing many things, and none more delightful than your rendering of the 'Impresario' for which I thank you and ask you to convey my thanks to each member of your company."

Another blind person, Miss Leila Holterhoff, of New York City, who has pursued her education to the point of taking a medical degree and who is prominent in welfare work, stated to The Wireless Age: "I believe that the radiophone will be the greatest single force in history in ameliorating the condition of the blind."

Not only are individuals profiting from radio through the ownership of sets, but institutions likewise are making use of broadcasting. So far, comparatively few have been able to secure receiving sets, as $250, the cost of an average set complete with a loud speaker, is a great deal of money to an organization that is continually begging in order to pay its running expenses.

Probably the first organization for the blind, at least in New York City, to make systematic use of radio was the N. Y. Guild for the Jewish Blind, which in September secured a modest

(*Continued on page* 40)

Olga Cook Says:

"Studio Attendants Are 'Models;' Their Expressions Give You a Key to the Radio Audience"

Tells How She Solved Problem of Gauging Her Efforts

Musical Comedy Star Explains Her Success to Interviewer

Olga Cook

HOW does a singer over the radio telephone know whether she is or is not making a favorable impression upon those who listen in? Is it possible to know?—Since her audience is "invisible," how then can she guide herself as she does when she is face to face with a public over the footlights?

These are questions I asked the smiling blonde star of the musical comedy success, "Blossom Time," and although Olga Cook has only had but one experience in broadcasting and has never passed through the somewhat similar experience of recording music records, she answered without hesitation.

She told how she had gone into the broadcasting studio of WJZ to sing the "Song of Love," which is the hit of her show, and even in the short time that it takes to repeat the lines, she had grasped the fundamental rule of successful radio telephone singing. The attendants became, to her, a sort of specimen public.

"A singer wants to see her audience," she told me. "It is almost a necessity. Success depends largely upon the artist's ability in catching the sympathy of those who hear her. When you are facing the audience in the theatre you know how you are 'going over.' If the audience is noisy, talkative or restless, you may be sure that their minds are on anything but your singing. But if, on the other hand, the big auditorium is quiet and the expressions on the faces before you are tuned to the words you are singing, then you know you have scored.

"This holds true equally well for singing over the radio telephone, despite the fact that it is a physical impossibility to see the great mass of your listeners.

SINGER'S LAST HOPE

"There remains one opportunity, however, for the singer and this opportunity she must grip with all the fervor and tenacity at her command.

"That last hope is the few who happen to be with you in the broadcasting studio. It is all-important to watch their expressions, because after all they are representative of the other hundreds of thousands who are hearing you. It is as if they were the 'models' of this vast audience much as a gigantic ocean vessel has in its model an exact replica.

"It is doubly important to catch the interest of these 'studio companions.' They hear so many sing, that you may be sure if you hold their attention, you are 'going over.'

"Another thing that impressed me in my broadcasting," she added, reflectively, "was the ghastly silence around me. It was rather uncanny and utterly unlike anything that I had ever been through before."

RADIO NO COMPETITOR

Then, thoughtfully: "I believe the possibilities of radio are tremendous, but do not believe that it will ever seriously compete with the stage, where sight is an all-important factor."

Olga Cook is well known to theatre goers. Before joining the Blossom Time Company she was a star on the vaudeville stage playing in B. F. Keith houses. Her voice is unusually rich in tone and her stage presence remarkable. She is of the striking blonde type, about five and one-half feet tall, and she radiates the out-of-doors atmosphere. Her success on Broadway was assured following her rather unusual debut in "Blossom Time" and listeners-in on the radio telephone are eagerly looking forward to the time when they may have the privilege of hearing her once more.

She told me of a conversation she had some years ago with a lighthouse keeper up along the rocky coast of Maine. It was during a week she was playing in a small vaudeville theatre and some members of the show conceived the idea of brightening the day somewhat by taking a trip out to the lighthouse that reared so majestically far out in the ocean.

They chartered a stout motor boat in the morning, and in about a half hour reached the sentinel of the sea.

The lighthouse keeper proved to be one of those grizzled natives, with facial features as weatherbeaten as the very lighthouse. He welcomed the visitors, as only one can who is continually shut off from the world.

LONELY LIGHTHOUSE LIFE

"He showed us about," Miss Cook said, "and then offered a cup of tea. And we sat about the rough, wooden table, listening to the stories he had to tell of the lonely nights spent out there, of the shipwrecks, the rescues, and all of the other sordid glamour of the sea.

"'Folks up there on the mainland really do not appreciate what a luxury you entertainers are,' he told us. 'I was reading in the papers how they came to hear and see you last Monday. Nothing like that for us, ever. But I wonder.' And he assumed a quizzical expression, little knowing, though, how truly he was reading the future.

"'I wonder when the time will come when we out here will be able to hear you all sing at the same time those in the theatres are hearing you. I believe that time will come. Your voice will be made to travel through the air and into this lonely house. Man will invent such an instrument.'

"And I hope," she concluded, "that that old sentinel will be the first of all the lighthouse keepers to get a radio receiver. What a blessing it will be for him!"

Powerful Church Station

It is not uncommon to hear of churches installing radio broadcasting stations, but the First Baptist church of Shreveport, La., is using a radio on a scale hitherto unapproached. The new church edifice, erected at a cost of $500,000 has installed in a ten-story tower a powerful radio broadcasting station. The auditorium of the church seats seven thousand persons and is located in the heart of the business district of the city.

It is stated that many small churches in the southwest have installed receiving outfits to take advantage of the offers of the Shreveport church. A good many of these churches are without pastors and are able to have sermons only at irregular intervals, but with the radio this inconvenience will be eliminated.

First Radio Evangelist

Paul Rader, evangelist, conducted the first radio revival ever given, pleading with sinners to repent and calling for converts to Christianity. In the broadcasting station atop city hall, Chicago, coat off, fists waving, biceps knotting, the revivalist who launched his Chicago campaign in his new gospel tabernacle went at his myriad listeners as though they were at the foot of his pulpit. A brass quartet, two cornets and two trombones played hymns into the receiving apparatus and to complete the program Rader sang. He had previously opened his fifteen-minute revival with prayer.

"One hundred thousand sinners within sound of my voice today must be saved," he thundered into the broadcaster. "The world is drifting. Crime rules and the temporal officials are blamed when religion and religion only, nonsectarian, unquibbling, undogmatic religion will bring the peace you pray for. All who hear me and wish to accept Christianity come to the tabernacle and I will pray with each individually."

Mr. Rader, who keeps fit by maintaining his old skill as a boxer, having been a sparring partner for Jeffries and Fitzsimmons in other years, put in as strenuous a fifteen minutes as he has ever done in the pulpit, he said at the conclusion of his meeting.

Radio for Apartments

The increasing popularity of the radio telephone is plainly evidenced by the volume of requests being received by several of the large real estate companies from tenants who desire to erect aerials, with the result that it is planned to wire a number of the larger apartment houses along Park and Fifth Avenues, New York City, and equip them with radio telephone service.

Principal Broadcasting Stations

KYW—360 Meters. Daily, 8 P.M. Central time, 9 P.M. eastern time. Westinghouse Station located at Chicago, Ill.

KDKA—360 meters. Daily, 8 to 10 P.M. Westinghouse Station located at East Pittsburgh.

WBZ—360 meters. Sundays, Mondays, Wednesdays and Fridays, 8 P. M. Westinghouse Station located at Springfield, Mass.

WGI—360 meters. Evenings. American Radio and Research Corporation station located at Medford Hillside, Mass.

WGY—360 meters. Tuesdays, Thursdays and Fridays, 7 P. M. General Electric Co. Station located at Schenectady, N. Y.

WJZ—360 meters. Daily. 11 A.M. to 10 P.M. Radio Corporation-Westinghouse Station located at Newark, N. J.

WVP—1450 meters. Evenings, 9 to 9:55 o'clock, except Sundays and Holidays. Signal Corps, Bedloe's Island. New York Harbor.

WWJ—360 meters, Daily, The Detroit News, Detroit, Mich.

KYJ—Lee J. Meyberg Co., Los Angeles, Cal.

KDN—Lee J. Meyberg Co., San Francisco, Cal.

WGR—Federal Telephone & Telegraph Co., Buffalo, N. Y.

WOK—Arkansas Light & Power Co., Pine Bluff, Ark.

WLB—Crosley Mfg. Co., Cincinnati, Ohio.

WOC—Palmer School of Chiropractic, Davenport, Ia.

WLB—University of Minnesota, Minneapolis, Minn.

Stations Broadcasting Music and Speech on 360 Meters

Additional List to Those Previously Published

WGF	The Register & Tribune	Des Moines, Iowa
WGM	Georgia Railway & Power Co. (Atlanta Construction)	Atlanta, Ga.
WGU	The Fair	Chicago, Ill.
WGV	Interstate Electric Co.	New Orleans, La.
WHD	West Virginia University	Morgantown, W. Va.
WHN	Ridgewood Times Printing & Pub. Co.	Ridgewood, N. Y.
WHX	Iowa Radio Corporation	Des Moines, Iowa
WIK	K. & L. Electric Co.	McKeesport, Pa.
WIL	Continental Electrical Supply Co.	Wash., D. C.
WIP	Gimbel Brothers	Philadelphia, Pa.
WIZ	Cino Radio Mfg. Co.	Cincinnati, Ohio
WJD	Richard H. Howe	Granville, Ohio
WJT	Electric Equipment Co.	Erie, Pa.
WKC	Joseph M. Zamoiski Co.	Baltimore, Md.
WKN	Riechman-Crosby Co.	Memphis, Tenn.
WKY	Oklahoma Radio Shop	Oklahoma City, Okla.
WMA	Arrow Radio Laboratories	Anderson, Ind.
WMB	Auburn Electrical Co.	Auburn, Me.
WMC	Columbia Radio Co.	Youngstown, Ohio
WMU	Doubleday-Hill Electric Co.	Pittsburgh, Pa.
WNJ	Shotton Radio Mfg. Co.	Albany, N. Y.
WNO	Wireless Telephone Co. of Hudson County, N. J.,	Jersey City, N. J.
WOE	Buckeye Radio Service Co.	Akron, Ohio
WOI	Iowa State College	Ames, Iowa
WOO	John Wanamaker	Philadelphia, Pa.
WPA	Fort Worth Record	Fort Worth, Texas
WPE	Central Radio Co.	Kansas City, Mo.
WPG	Nushawg Poultry Farm	New Lebanon, Ohio
WPI	Electric Supply Co.	Clearfield, Pa.
WPJ	St. Joseph's College	Philadelphia, Pa.
WPL	Fergus Electric Co.	Zanesville, Ohio
WPM	Thomas J. Williams	Washington, D. C.
WPO	United Equipment Co.	Memphis, Tenn.
WRM	University of Illinois	Urbana, Ill.
WRP	Federal Institute of Radio Telegraphy,	Camden, N. J.
WRR	City of Dallas (Police and Fire Signal Department)	Dallas, Tex.
WRW	Tarrytown Radio Research Laboratory,	Tarrytown, N. Y.
WSB	Atlanta Journal	Atlanta, Ga.
WSL	J. & M. Electric Co.	Utica, N. Y.
WSN	Ship Owners Radio Service	Norfolk, Va.
WSV	L. M. Hunter and G. L. Carrington,	Little Rock, Ark.
WSX	Erie Radio Co.	Erie, Pa.
WSY	Alabama Power Co.	Birmingham, Ala.
WTG	Kansas State Agricultural College,	Manhattan, Kans.
WTK	Paris Radio Electric Co.	Paris, Tex.
WTP	George M. McBride	Bay City, Mich.
WWB	Daily News Printing Co.	Canton, Ohio
WWI	Ford Motor Co.	Dearborn, Mich.
WWL	Loyola University	New Orleans, La.
WWT	McCarthy Bros. & Ford	Buffalo, N. Y.
WWZ	John Wanamaker	New York, N. Y.
KDYL	Telegram Publishing Co.	Salt Lake City, Utah
KDYM	Savoy Theatre	San Diego, Calif.
KDYN	Great Western Radio Corp.	Redwood City, Calif.
KDYO	Carlson & Simpson	San Diego, Calif.
KDYQ	Oregon Institute of Technology	Portland, Oreg.
KDYR	Pasadena Star-News Publishing Co.,	Pasadena, Calif.
KLX	Tribune Publishing Co.	Oakland, Calif.
KNX	Electric Lighting Supply Co.	Los Angeles, Calif.
KQI	University of California	Berkeley, Calif.
KYI	Alfred Harrell	Bakersfield, Calif.
KZV	Wenatchee Battery & Motor Co.,	Wenatchee, Wash.
WAAD	Ohio Mechanics Institute	Cincinnati, Ohio
WCAB	Newburgh News Printing & Publishing Co.,	Newburgh, N. Y.
WCAC	John Fink Jewelry Co.	Fort Smith, Ark.
WCAD	St. Lawrence University	Canton, Ohio
WCAE	Kaufman & Baer Co.	Pittsburgh, Pa.
WCAG	Daily States Publishing Co.	New Orleans, La.
WCAJ	Nebraska Wesleyan University,	University Place, Nebr.
WCAK	Alfred P. Daniel	Houston, Tex.
WCAL	St. Olaf College	Northfield, Minn.
WCAM	Villanova College	Villanova, Pa.
WCAN	Southeastern Radio Telephone Co.,	Jacksonville, Fla.
WCAO	Sanders & Stayman Co.	Baltimore, Md.
WCAP	Central Radio Service	Decatur, Ill.
WCAQ	Tri-State Radio Mfg. & Supply Co.,	Defiance, Ohio
WCAR	Alamo Radio Electric Co.	San Antonio, Tex.
WCAS	William Hood Dunwoody Industrial Institute	Minneapolis, Minn.
WCAT	South Dakota State School of Mines,	Rapid City, S. Dak.
WCAU	Philadelphia Radiophone Co.	Philadelphia, Pa.
WCX	Detroit Free Press	Detroit, Mich.
WHB	Sweeney School Co.	Kansas City, Mo.

Genuine Radio Sleuth

William J. Burns, Chief of the Department of Justice, Bureau of Investigation, told a story recently in which radio took the part of Sherlock Holmes. A dapper young man appeared one day before the sales manager of a large radio manufacturing plant, and explained that he wanted to purchase a very fine receiving set for a local high school. He was greeted cordially and the best of the house's sets were demonstrated. Ordering an expensive set, he managed somehow to secure delivery without payment, and then disappeared. The set also vanished from the place it had been shipped to originally much to the chagrin of the manufacturers who decided to advertise their loss through radio itself, being able to give a very accurate description of the young man, who had a noticeable scar on his cheek.

Chapter two opens in an apartment where a genial and fine appearing young man, with a scar on his cheek, is entertaining his friends with a new receiving set. Suddenly the instrument begins to tell of the manufacturer's loss and give a detailed description of the thief—unmistakably the host! The consternation of the guests may be imagined. The next morning a very worried mother paid for the instrument which her son had wanted so badly, he had evolved the above scheme for getting it, whereupon the manufacturer dropped the matter.

"Not Only for Children"

"Radio telephony is not for men, moys and girls only," said Edward D. O'Dea, of a Buffalo firm, speaking before the Buffalo Women's City Club in the Iroquois hotel. "Radio is as much a thing for the women as it is for anyone."

Mr. O'Dea explained the workings of a radio set and with a working model demonstrated how messages were received.

The wireless telephone, Mr. O'Dea pointed out, is one of the greatest influences on home life today. It is a means of keeping the young people at home evenings instead of seeking pleasure in other places.

"In a New Era!"

For the second time a judge has ruled that radio transmitting is not a "nuisance."

Chancellor J. E. Martineau, of Pulaski Chancery Court, Arkansas, ruled in this way when he refused to issue an order restraining enthusiasts from transmitting between 9 p.m. and 7 a.m. The complainants objected to "buzzing noises." The chancellor said that "we are in a new era. We must become accustomed to the buzz."

Radio in the Great Outdoors

Vacation Time Throngs the Woods and Waters with Wireless Enthusiasts Who Carry Their Hobby with Them

By Sam Loomis

THIS year as never before the great American vacation grounds are linked to the centers of population from which their visitors come. The radiophone is bringing to seashore, lake and mountain, to yacht, motorboat and automobile, the news, music, speeches and lectures of the national network of broadcasting stations.

No longer does a vacation in the country mean putting up with cracked phonograph records, pianos that date back to the flood, and newspapers one or two days old. No longer does a camping or canoe trip in the forests mean a complete separation from the rest of the world.

Amateurs skilled in code communication for years have been taking their receiving sets along on vacations, and a few even have carted their transmitting apparatus about. This year, however, more radio apparatus has gone on tour than ever before in the history of the world, for the vast general public, listeners-in since the Winter, doesn't want to lose its contact with the broadcasting stations.

Hence almost any outdoor center this Summer is likely, in fact, more than likely, to have one or more radio receiving sets. Camps for boys and girls, study camps, fishing clubs, engineering school camps, bungalow colonies, yacht clubs, lake colonies, mountain top resorts, wayside automobile camps, mining and lumber camps, and just plain camps—today all use radio to tap the currents of the world.

The amateurs years ago were the first to demonstrate the possibilities of Summer-resort radio, long before the radio telephone was more than a hope in the minds of those who were experimenting with arc transmission.

Every locality has its own radio characteristics, just as it has its climatic and topographical individuality. You have to visit a place in order to enjoy the climate and admire the views, and likewise you have to listen in when you get there to discover just what traffic can be heard in the air.

This is the great fascination of vacationing with a radio set. The amateur who has worked his neighborhood and maybe the nearby districts as well during the Winter, wonders what conditions he will find in the new location. Putting up a make-shift aerial, making as good a ground as he can, he hastens to hook on his set and listen.

Woof Woof listens in and says "It's a bear!"

DIT DIT DAH DAH DAH DIT DAH DIT DIT DIT

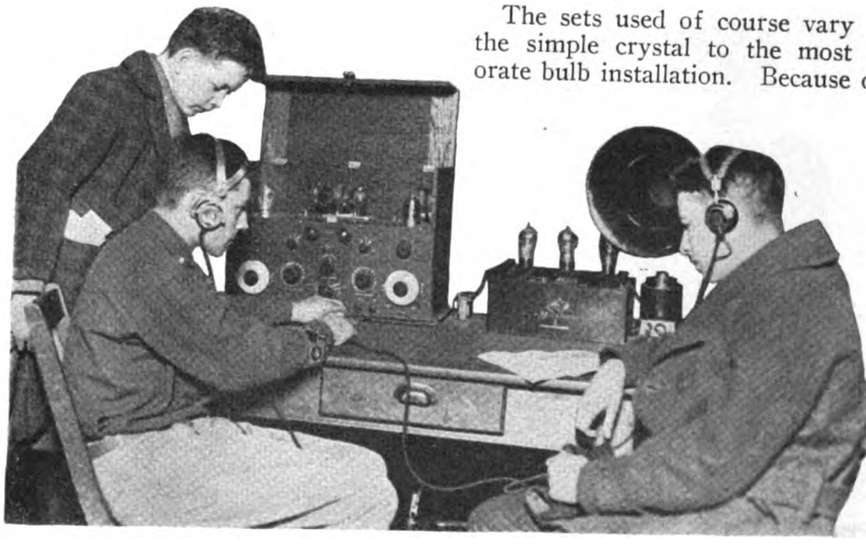
And down goes a note: "2AS." That is a new station. Who is 2AS? The message is copied, and then a reply from 2XY. The air is full of new stations that the listener had never heard before.

Trying a longer wave length, he breaks in on a strange commercial station. Another change, and a ship is heard. Still another turn of the knobs, and a new district comes swinging in. Fading has a new periodicity; at home, signals from certain points of the compass always faded in a certain manner, and a different degree at other points. At the Summer camp, all these conditions are changed, and points that previously were inaudible may come in with great strength, while some that were the most easily heard at home may be beyond audition at the new location.

The amateur, fascinated, sits for hours with the headphones clamped to his ears, copying station after station. The great outdoors calls at the door of his shack or tent—but the only calls the amateur listens to are the numerals and letters that flash through the ether. He is too busy exploring the local radio country to ramble through the woods and fields about him, or to pay attention to the lake or river or bay or sea beside which he sits.

When the "radio country" has been charted, so to speak, then he will perhaps allow the rest of the party, impatiently waiting a chance at the set, to listen in while he goes out into the open—to gaze at hill and dale and wonder why it is that signals seem to come in with great strength over or through the mountains to the north west, while hardly any seem to be able to pass through the broad flat valley to the east. "Radio exploring" is the most fascinating of the amateur's Summer amusements.

The sets used of course vary from the simple crystal to the most elaborate bulb installation. Because of its


Radio receiving sets now are part of the equipment of many Boy Scout camps, affording entertainment and instruction at the same time

extreme portability and lack of batteries, probably the crystal set is the most popular for vacation trips, and hence it may be estimated that about 70 per cent. of the receiving sets in vacation use have crystal detectors. These of course are entirely satisfactory for limited distances, and are being used in all the resorts near the big cities. The Adirondacks, for instance, this Summer are literally full of them, profiting by the powerful broadcasting station of the General Electric Company at Schenectady, N. Y., and the shores of the Great Lakes likewise are dotted with enthusiasts who listen to the code traffic of the steamers and to the broadcasting stations at Buffalo, Cleveland, Chicago, Detroit, Dayton and Toledo.

The main difficulty in the use of the bulb set for temporary installations is the weight of the storage battery. In the case of the motorist, however, this is easily overcome, for the car can carry the wireless equipment, and it even is possible to use the starting and lighting battery of the automobile for lighting the bulb filaments. Many motorists are doing this very thing.

In fact, so general has become the custom among owners of bulb receiving sets that one automobile manufacturer, the Chevrolet Motor Co., this Spring began to offer a sedan model fully equipped with a Westinghouse RC set, including a loop aerial, with connection to the car's regular battery for the necessary current. This has proved a successful installation, though of course the engine of the car must not be running when it is desired to receive, on account of interference from the ignition system.

By far the greater portion of the radio receiving sets used by motorists, however, instead of being installed more or less permanently on their cars, are merely transported in them, being put in operation at the end of each day when camp is made for the night, and a semi-permanent installation made when the destination is reached.

There are two items that sometimes give trouble in vacation installations—the aerial and the ground. Trees of course are easy to fasten aerials to, especially if there is a rising young man in the party. The ground connection is a bit more difficult unless some partly-buried pipes are handy. Dropping a bare wire in a lake or bed of a stream often is the easiest plan to follow.

Kite Experiments

From these simple practices the stunts tried by wireless fans run all the way to the use of kites and even balloons. One internationally-known amateur some years ago experimented with kite aerials, flying the kites from the deck of his motorboat. By sending the kite up to an altitude of about 1,000 feet he discovered that he could overcome many of the limitations of his locality, copying stations not previously heard, whether because of peculiar local conditions, or because of distance.

The drag of the kite, however, made the length of the aerial wire so great that some difficulty was experienced in tuning the shorter wave lengths, and in order to secure a more vertical wire it was decided to try a balloon. A small one accordingly was secured, inflated, and sent aloft, with remarkable results until suddenly it was noticed that the signals were becoming weaker and weaker. On going on deck, the aerial was found trailing in the water, and the tatters of the balloon floating on the surface. The heat had expanded the gas in the balloon and burst it. That was the last experiment with a balloon—the operation was successful, but the balloon died!

Even when far from camp, the wireless fan on horseback can stop for a moment and listen for news of the great cities miles away

The ground used on this motor boat consisted of a series of copper plates fastened along the keel of the boat. As the boat was used in salt water in and around Long Island, the ground was a perfect one.

In other installations on motor boats, trailing wires have been used, but these sometimes have a way of getting tangled up in the propeller, for when the boat anchors for the night it is sure to be swung about by wind and tide. In cases where the boat is tied up to a steel buoy, anchored to the bottom by a cable leading to a cement block imbedded in the mud, the ground wire frequently is attached to the buoy.

Other grounds on a motor boat consist of the frame of the engine, the metal piping of the cooling system or of the toilet, while a counterpoise can be arranged by running a wire completely around the boat, inside or outside. All these have been used by various experimenters, though the use of copper plates on the bottom of the boat probably has proved the most successful.

On dry land, grounding problems depend on the degree of dryness—the dryer the land, the poorer the ground. Where plenty of wire is available, a counterpoise often is the best thing to use. However, except in the case of parties exploring the Great American Desert, where the land is loose sand and no trees are to be seen, most Summer visitors select places provided with plenty of water. The visitors to the desert, of course, now take radio sending sets along for the sake of safety, so that they can communicate with the nearest station and secure help should some mishap befall the expedition, just as Amundsen and other explorers now carry radio equipment.

Water Means Good Ground

For the average person, however, a Summer trip means a visit to the seashore, to a lake or river. What is a camp without a swim? Even for those who neither hang their clothes on a hickory limb nor go near the water, adjacent bodies of water are considered indispensable to Summer resorts—they cool the air and attract the young folks.

Where there is water there is good ground for the radio set. Often a hole dug down a few feet will reveal a suitably moist layer of earth, in which can be buried an ancient metal bucket, some old pipe, a mess of wire, or some similar scrap metal to form a ground. If the camp has an artesian well, as many have, connection can be made to the pump, as the casing of iron pipe leading from the pump down to bedrock, all moist inside and outside, forms a perfect ground.

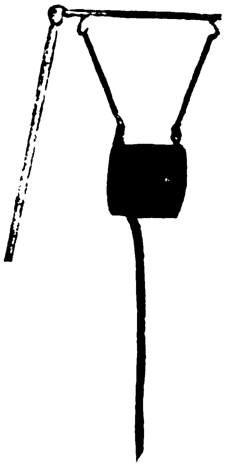
Other grounds are lightning conduc-

(*Continued on page* 38)

"A BROADCAST review of a theatrical production will prepare those in rural communities when they come to the City to see the current shows"

Maurice Henle Interviews Bertha Brainard the Girl Who Originated the Idea of

Broadcasting Broadway



Miss Brainard is a Greenwich Village Girl

A DRAMATIC department or the "radiophone review," as it might be called, was inevitable. It was as sure as radio itself, and when it came there was not even a suggestion of a raised eyebrow, a look of astonishment.

The dramatic department of the ordinary newspaper is a most important part of the daily print. People come to regard it as the expression of a competent critic, who tells them whether a play is good, bad or indifferent. Many thousands of readers are guided by the message of the dramatic critic, so that the service which the theatrical column in the newspaper renders is invaluable to the theatre.

When radio came along, among the first words to be heard were expressions of amused wonder as to when someone would start a dramatic review department over the ether wave. Things went along for several months without anything happening along these lines, but finally there began to appear in the weekly programs of WJZ one short line reading "Broadcasting Broadway, by Bertha Brainard." When the reader of the programs finally penetrated the meaning of the avalanche of alliterative B's, he realized that the thing had at last been accomplished, and that those who listened in were going to be benefited by an additional service.

Bertha Brainard lives in Greenwich Village, New York City, which may or may not be the reason why she is an energetic young woman with ideas. She was the one who suggested to officials at WJZ the possibilities and value of broadcasting dramatic reviews. They accepted the suggestion readily.

REVIEWS MUSICAL PLAY

On one occasion she broadcast a review of the musical play "Blossom Time." It was immediately after this that I sought Miss Brainard with a view of asking her to speak through the columns of THE WIRELESS AGE to her radio audience. I thought as I talked to her that the reader would get but a faint idea of how Miss Brainard looks, because unfortunately her brilliant red hair registers only as black in the photograph reproduced on this page.

She listened quietly while I was asking her what in her opinion was the most important result accomplished by her talks.

"The greatest value of this work," she said, "lies in the service that it gives those who live out of the city. I might add that I have substantial proof to back this up.

HELPS RURAL COMMUNITIES

"There are many thousands of persons scattered about New York within a radius of one hundred miles. Many of them do not receive New York newspapers. Many of them consider coming into the city an event, and if a trip is made more often than once every two or three months it is most unusual. We believe that they, when they do come to the city, act much after the fashion of our visitors from more distant points.

"When the man from Ohio, Indiana or Illinois comes to New York with his family, the first thing the family thinks about is to see the Woolworth Building, Grant's Tomb, and Central Park. The second thing the family thinks about is to see the shows on Broadway. If the family goes back without being able to tell the home folks that they 'took in' some Broadway show, the fascination of the trip loses considerable color in the eyes of the home folks. And so the New York theatres are always filled with visitors from out of town.

"This holds true equally as well for those who live within a hundred miles of New York and only come to the city three times a year as for those who live a thousand miles away and make a trip once in two years. These people do not know, cannot know, which plays are the better ones and they are very grateful for the opportunity to find out if a play is worth while before spending their money to buy tickets for it. Sending out a broadcast review goes far to eliminate the possibility of these out of town people going to New York unprepared as far as knowledge of the current plays is concerned.

EXPLAINS THE STORY

"I commence by telling the radio audience immediately the type of show I am going to review—that is, whether it is musical, dramatic, straight comedy, comedy drama, or what. If the play is founded on a dramatic episode, as in the case of the play you just heard me review, 'Blossom Time,' which is written around an incident in the life of Franz Shubert, I tell that, and mention the names of the people who wrote the music, the lyrics and the book. I explain on what the action of the played is based.

"Then I describe the scenery and the costumes and go on to tell the story of the play in chronological order, act

(Continued on page 40)

Broadcasting In London

GREAT BRITAIN has been suddenly awakened to the possibilities of the radiophone. While America was developing radiophone broadcasting, Great Britain sat by and watched and its newspapers made comments on "America's radiophone."

Now Great Britain is in the radiophone game to the hilt.

Postmaster-General Kellaway has announced that a broadcasting service is to be instituted by the Post Office Department. There will be a limited number of broadcasting stations, probably in London, Cardiff, Plymouth, Birmingham, Manchester, Newcastle, Glasgow and Aberdeen.

Licenses will be necessary for those who wish to install receiving sets and a fee of $2 will be charged for each license.

> "We do not want wireless free to all, as is the case in America, with regrettable consequences," said Godfrey Isaacs, head of the Marconi Wireless Company. Sooner or later in America they will have to institute some measure of control, such as that with which we are beginning.
>
> "We are only on the threshold of it all. Nobody has any possible conception of what it all may develop."

The Postmaster-General proposes that all broadcasting shall be done by the Post Office Department and that those who wish to broadcast concerts and speeches must arrange for their programmes with the postal officials.

The new wireless possibility is looked upon with enthusiasm by members of the House of Commons, and with a forthcoming general election in view it has been seriously suggested by some members that a broadcasting station should be installed in the chambers of Parliament in order that all of the proceedings might be open to any who cared to listen.

The sale of radiophone receiving sets in London has been great since the announcement of the Postmaster-General.

"The Wireless Voice"

"IN commenting the other day on the prospect of wireless telephony for all we said that it opened an amazing vista, reads an editorial in the *London Times*.

"We instanced many of the surprising opportunities which it will bring to the domesticated and stay-at-home, but for the moment we did not refer to the astonishing opening which it offers to those in search of a profession. We mean the operators of the new wireless, the new heralds, whose voices will simultaneously address millions and overcome for a wide radius in every direction all the material obstacles which have hitherto defied the most stentorian town crier. Before long we shall know what are the various points of the ideal 'wireless voice'; its merits will be discussed as we now discuss those of a bass or a tenor; and appointments to the post of wireless herald will clearly depend on the tone and accent of the applicant."

New Canadian Station

LA PRESSE, of Montreal, Canada, has signed a contract with the Canadian Marconi Company for the immediate installation of a radio broadcasting station. At stated hours each day, starting early in June, it will broadcast in French and English condensed bulletins of the most interesting news of the day, as well as attractive excerpts from the feature pages of the paper.

"Esperanto Logical Outcome"

BELIEF that a universal language, possibly Esperanto, will be the logical outcome of radio telephony was expressed recently by Prof. A. Christian of the department of languages of the University of Glasgow. Professor Christian came to the United States to deliver a series of lectures at Columbia University, before the National Geographic Society in Washington, at the Universities of Pittsburg and Pennsylvania, and before the Washington high schools.

"The radio telephone," said Professor Christian, "played an important part at the conference at Genoa. It enabled diplomats to ascertain the views of their home governments when time limitations precluded the use of other media of communication.

"Radio is doing more in Europe to dissipate mistrust and ill feeling and to break down the traditional barriers of secret diplomacy than any other single agency. It is hoped by advocates of one universal language that radio will eliminate the dialect distrust among all nations."

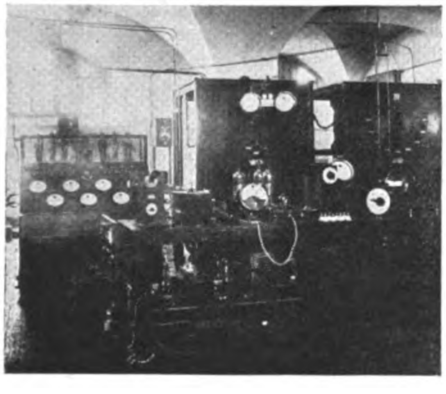


Photo shows firs. broadcasting station to open in Germany. It is located in Berlin

Latin America a Radio Field

"RADIO broadcasting has assumed such tremendous proportions throughout the United States that it is entirely reasonable to expect that this newest of popular arts will soon find its way to neighboring countries and particularly Latin America," says Col. C. H. Nance, of the Radio Corporation of America.

"The field for radio broadcasting in Central South America is of exceptional importance, for its introduction will bring great educational and entertainment advantages more cheaply and far more effectively than any other medium.

"In the southern continent communications are not so well developed as those of North America, owing to geographical and other natural barriers which make impracticable the installation of telephone and telegraph lines and the dissemination of news by means of the newspaper and other carriers.

"Radio obviates all such conditions because no land lines are necessary, and its influence has a broad and far-reaching scope which comes at once within the reach of every home located within receiving range of the broadcasting station. There are certain agents in the foreign field who have foreseen the possibilities of radio broadcasting and who are today planning large and effective radio broadcasting services which will reach even to the most isolated hacienda."

Taxes Puzzle the French

THE radiotelephone has begun to attract popular attention in France, as concerts and weather reports are broadcasted from the Eiffel Tower (FL) in Paris. The situation in France is somewhat complicated, however, as FL's schedule is irregular, and the Postal, Telephone and Telegraph Bureau is endeavoring to tax all receiving sets as well as transmitters. At first the tax was 5 francs for each receiving set, now it is 10 francs, and it is proposed to raise it to 20, which latter sum would be more than the cost of a simple crystal set. A tax of 250 francs is to be imposed on transmitting sets. However, the entire situation is clouded by doubts as to the legality of the tax, and hence French amateurs are inclined to await the decision of the courts.

Tax On Canadian Sets

CANADIAN radio fans do not enjoy the privileges in radio of their American neighbors. In Canada it is necessary to secure a Government license to operate a radiophone receiver and the tax is $1 per installation. Applicants are required to secure a license within 10 days after a receiving set is installed.

RADIO makes it possible for homes to have an "audible background" just as they now have a visual background. Inasmuch as music has a great subconscious influence, the importance of radio can not be over-estimated. It will mold the character of our children, influence adults, and bring new happiness to our lives.

Major General George O. Squier

What the Manufacturers of America's Musical Instruments Heard When Addressed

By Maj. Gen. George O. Squier

I AM a radio fan and a radio bug. I am very much interested in it. This art that is now so prominently before the people is just about of age, twenty-one years old, and it is probable that it has progressed more than any other movement since the world began. We have all seen certain movements and fads come along, such as the cheap motor car, the Kodak, roller skates, etc.; but the question now is, "Has radio come to stay?" My belief is that it has, that this is not a temporary fad, but is here as a great agency which is destined to change very profoundly our modes of life.

It is a very wonderful thing to be able to broadcast a beautiful song by a prima donna, making it audible not only over this earth of ours, but as far as we know to the most distant planets.

Music is, of course, of special interest to the musical world. I am not a musician, I do not play any particular instrument, but I enjoy music of all kinds. It influences me very much. I do not have a cultivated taste, but I enjoy everything from jazz through to grand opera. I think that radio someway or another will develop music, both in its production and in its methods perhaps more than any other single movement.

This is just a guess of mine. I could not tell you how it is going to be done, but there is a demand for more music of various kinds, and radio is a great agency that will help fill that need.

Music is an understandable, international sort of language; in fact it is a super-language that begins where speech quits. Two people can enjoy classical music even though they can't say an understandable word to each other and I have had this happen to me frequently in Europe. Music has an international appeal that no language has. It has an influence that we are just beginning to realize; it appeals to the ear instead of the eye. While great attention has been paid to the uses of the eye, I think we have hardly begun to develop the possibilities of the ear.

The ear is universal. It hears everything within audible range, while the eye can see only that at which it is directed. A person has to look in order to see, but he has to listen, willy-nilly, to what is in the air around him, and he understands it subconsciously, without mental effort. You are taught the ear at your mother's knee. In some sort of language we can reach the aliens coming into this country from the first day by the ear.

Furthermore, the psychological influences of certain organized harmonies is very great. We realize the importance of visual harmonies in decorating our homes with beautiful lights and colors. We employ interior decorators who furnish our rooms with all sorts of beautiful things to please our eye, and I am wondering why we cannot furnish them to please the ear also.

If we can do it in a cheap way on a regular basis, and supercede the other noises that we find in the ordinary cities and towns, which are not altogether agreeable, we must add to the pleasures of life. We could furnish our houses with noises—music—dimmed as we please, nurseries having one kind of "audible background," bedrooms another and salons another. We could furnish this atmosphere methodically, instead of topsy-turvy. Manifestly in developing this new idea, engineering would reach a new stage where we could furnish culture to people as an engineer would, on a watt basis.

These are possibilities. I admit they are a bit speculative but some of us must be visionary as well as practical. It behooves us to look ahead if we can. I think that radio offers a tremendous cultural opportunity of putting the spoken word any distance, or the beautiful combinations of sound which we recognize as music. This is the best

Broadcast music to the nursery. Bring children up so they will know the best music, because they have played to it

opportunity music has had for centuries—giving it to the masses of the country in their very rooms and doing it on a practical basis. It opens new methods of advertising, new methods of culture, new conditions of labor.

Is there any reason why we should not have restful, beautiful music played in the sweatshops where men and women work making garments? If we can do it by plugging into the light socket a very simple apparatus that delivers that music as cheaply as an electric fan delivers air, it would be entirely feasible.

If we take all noise and light away we will very soon lose our sense of proportion. Let's select the kind of noises that we want and organize them and deliver them into our homes. I should say there might be a professional interior decorator for sounds, just as we have for visible things.

Music has a great power over people; it has a great uplifting power that none of us can explain. You don't have to be at all educated to understand it. You may not know any music technique at all and yet be absolutely thrilled by music. We scarcely realize as yet what the great power of music is or may yet be.

Let us take hold of this new agency which projects music to the stars and go into it and cooperate and investigate and experiment in every possible way. Let us develop to the utmost this new radio broadcasting which has burst upon us so suddenly.

At the same time let us develop music. Broadcast it to the nursery. Bring children up so they will know the best music, because they have played to it. If we can reduce it to an engineering basis and sell it cheaply, which I believe we can, we can broadcast culture; you can have the child, and the adult, the rich and the poor, hear any kind of good music.

Radio in the Great Outdoors

(*Continued from page* 34)

tors, water pipes such as frequently are found in camps to lead water from springs, and even a wire fence, if one should happen to run near the aerial. In fact, wire fences have been used for both aerial and ground, or rather, aerial and counterpoise.

The opportunities offered by a new location out of doors are endless, and that is why the Summer, despite its static problems, is so fascinating to the amateur. At home he may be more or less limited. Having found what seems to be the best installation for his home location, the operator touches it very little. The aerial and ground stay put. The operator spends most of his time listening in. But when he is experimenting with a temporary installation he can yield to the temptation to try "stunts" that he would never think of anywhere else, and whose results will give him some wild tales that his neighbors will never believe.

There was the man, for instance, who reached up and drove a nail in a tree, and another in the ground, and received on a six-foot aerial. And the man who put his set on the ground and discovered that he could receive as long as he kept one finger on the antenna binding post. Also the boy who used his bicycle for an antenna when it was standing insulated on its rubber tires, and for a ground when it was lying on the ground. Again, there was the man who was troubled with thunder storms until he discovered that if he took one end of the aerial down and wrapped it around a tree as soon as a thunder storm approached, the aerial became vertically directional, most of the static disappeared, and he could continue to copy code. True, that ingenious fellow got a severe shock one day when a flash of lightning happened to pass directly overhead, right in the direction in which the aerial was pointing, but he considered that part of the game. Most people, of course, ground the antenna and stay away from the set during thunder storms. When the wire is thus grounded it forms an excellent lightning protector, and if attached to a house or extending over a row of tents or bungalows, it may save them from being struck.

Incidentally, new interest is lent to static this Summer by the emphasis that is being placed on radio frequency amplification. It has been found that static currents are at audio frequency, and therefore, if two steps of radio frequency amplification are placed ahead of the detector, most of the static is strained out, so to speak. After the detector come two steps of audio frequency amplification, and the volume of sound that is produced is not only large, but comparatively free from the crackles of static.

Radio Frequency

A great portion of the experimentation being done this Summer is on circuits of this type. They require five or six bulbs, and draw quite a little current from the battery, necessitating frequent charging. Many camps and Summer hotels, however, if they do not have electric current from a high tension line, have individual electric light plants, run by gasoline engines, of the type made by Delco-Light, Willys-Light, and the other manufacturers of such apparatus. Places where there is either a high voltage line or a private plant are of course especially suited for wireless experimentation, as they offer an easy source of current.

In some cases the presence of a high tension line will be found to cause interference with radio reception. Usually this occurs when the antenna is placed parallel with the power line, and can be remedied by turning the aerial wire at right angles to the line.

Directional Experiments

Directional work always forms an interesting part of outdoor activities, for changing the direction of the antenna usually is more or less easily accomplished. It is easy to discover which points of the compass are the best for receiving certain stations. Where the set is mounted on a boat, direction work is perhaps easiest, unless a revolving loop is used.

Canoe installations will be popular this Summer, particularly in the public parks, such as Belle Isle, at Detroit, where for years the evenings have been rich in the melodies from talking machines. This year the radio set has taken its place beside the talking machine for canoe use. At Detroit especially is this true, for there the talking machine has been for years almost as essential in a canoe as a paddle. Now the presence of a broadcasting station right in the city makes it easy to receive in Belle Isle Park, in the river nearby, with crystal detectors, while those who have more elaborate sets, including a loud speaker, rival the phonograph.

Wireless Chess

A CHESS game by radio, from mid-Atlantic to Chicago, was played recently between Edward Lasker, American amateur chess champion and E. T. Grumbach of Chicago and New York.

The two had planned a game when Grumbach was suddenly called to Europe. He sailed on the *President Taft* of the United States Lines, after making arrangements to fight out the game through the ether.

Grumbach's moves were wirelessed to the steamship company's offices in New York and then wired Lasker in Chicago. His return moves were transmitted the same way.

Radio In Texas Movie

CONCERTS, lectures, addresses from all parts of the country in moving picture houses by radio is the latest—and the Iris theater of Houston, Texas, not only has the distinction of introducing the latest in Houston but in the entire South.

Patrons of the Iris theater recently were given a surprise when Manager Will Horwitz, Jr., reproduced for them a radio concert.

"PERHAPS, in the early development of the human mind, mental telepathy was universally a fact. We may regain the lost gift. Would it be progress for us? That I do not know"

An Interview With

Olga Petrova

By H. N. Lee

Olga Petrova

WILL the time ever come when the human mind will be tuned to such a fine point that it will catch signals which now cannot be heard without translation through the medium of a mechanical instrument such as the radio telephone?

Let us suppose—

You are talking to someone who stands one hundred feet away and that person continues to move backward until he reaches the point where the sound of your voice is no longer audible. Behind him, however, at some distance a dog could stand and could pick up the sounds which the human mind misses. And back of this point is a zone where the dog no longer will be able to hear the sounds, but in which the horse could hear.

This has been proved.

Will the time ever come when the average human mind will be so delicately attuned that it will catch the vibrations which certain brains, far inferior, now can pick up?

Madam Olga Petrova, international star, believes it will.

Not very many weeks ago the vast radio audience was told that a new studio was being dedicated at WJZ. They listened in a little more eagerly that night because on the program was the name of Olga Petrova.

Many Original Ideas

Officials of the Radio Corporation-Westinghouse Station of Newark, New Jersey, wanted to make this night one long to be remembered and that they succeeded is attested to by the thousands of letters which Madam Petrova received. The radio audience wants to hear Madam Petrova, not once more, but many times, again in the future, and it is believed that their wishes will come true.

I was sure that a woman who could so interest her radio audience the way Madam Petrova did, would have some very interesting comments to make about the radiophone.

The star and her husband, Dr. John D. Stewart, live at Great Neck, Long Island, but it was at lunch at the Hotel Plaza in New York City that the interview for the readers of THE WIRELESS AGE took place. Madam Petrova launched the conversation with the thought that appears at the beginning of this article.

"But," I asked her, "will this be progress for the human race or will it mean a reversion to an ancient type?"

"That cannot be said," she replied. "It is entirely possible that it will be a retrogression."

She made an interesting observation at this point. She said she believed that sound goes on infinitely—it has no stopping place.

"I think that everything is up there!"—and she raised her shoulders slightly in a charming little shrug that expressed volubly her awe at the magnitude of the infinite. "It is there—only we cannot hear it. The sound goes on for millions and millions of miles.

"And then," she added, "consider thought. I know that my dog can tell when I even am feeling sad. Doesn't that indicate something to you? The dog's mentality is able to 'pull' something from humans, as it were.

"Have you ever noticed that the so-called mediums and clairvoyants are persons of inferior mentality? They are crude. Many times they are stupid and most of them are ignorant. That these people are able to pick up things which are in the air about us and which we do not know even exist—and there is no question but that they can—would indicate that such an abiltity does not reveal a higher intelligence. Obviously it is just the opposite."

Madam Petrova interjected here the thought that she is not by any means a spiritualist, in the commonly accepted sense of that word. She does not believe, she emphasized, that, should the time ever come when the human mind will pick up signals and sounds which it cannot pick up now, that such ability will be brought about through the aid of those mentalities which have passed from our material world, but she is firmly of the opinion that it will be entirely physical in the sense that we will only discover a hidden mechanism in the brain or possibly, as she puts it, "re-discover it."

Won Fame in Movies

Madam Petrova probably won her most lasting fame as a motion picture star. Born in Poland, she came to London while still very young. In fact she is half English. While still in her 'teens she decided she wanted to be a newspaper reporter; and so she took a job on one of London's dailies at the tremendous salary of one pound sterling a week. She not only did reportorial work, but creative work as well, such as dramatic reviews, special articles, and so forth, but she found, much to her dismay, that she could not have freedom of expression and that many times the policy of her paper demanded that she leave out a significant word here and there in her dramatic review.

She was the same impulsive, determined Madam Petrova then that her audience later grew to admire, and it was not long before she left the newspaper in order to turn her efforts in a channel which would permit the utmost freedom of expression. Her new medium of expression was the drama, and her initial efforts were confined to Shakespearian parts on the London stage. Several years later found her a star in the motion picture world.

(Continued on next page)

Broadcasting Broadway

(*Continued from page* 35)

by act, until the final curtain. I do not give full details, of course, nor do I attempt to give any of the dialogue. And then I wind up by telling about the producer of the show and whether or not he has succeeded in his efforts to make it all that it should be."

"And what," I asked her, "is the next important thing that you believe your broadcast of these reviews does?"

"Well," she replied, "it certainly brings home to the theatrical producer the idea that radio can only be another means to help him and that, contrary to the gross misimpression, radio will not hurt, but will help, the box office of the theatre."

Miss Brainard has some very interesting letters written by those who listen in; they constitute the "proof" of which she spoke above. Typical is the following:

> Pine Brook, N. J.
>
> My dear Miss Brainard:
>
> Your talk on the play "The Goldfish," on Friday, May 5th, at WJZ, was very interesting, and your "New Idea" of discussing current plays appeals to me very much.
>
> There is no doubt in my mind that your talk was enjoyed by all who heard it, but I assure you that it was most appreciated by those of us who reside in the country, and haven't much chance to come in contact with, and be advised as to what plays to see by people who frequent the theatres as often as city people do.
>
> I assure you that the next play I see is going to be "The Goldfish," for your detailed account of Jennie and her troubles has aroused my interest to such an extent that I cannot wait until the time comes.
>
> I heard your talk in the Pine Brook Post Office where there is a loud speaker which enabled quite a number of people to enjoy the discussion. When I suggested writing a letter to you immediately they all wished to sign their names to show you that their sentiments are the same as mine.
>
> I am, sincerely yours,
>
> (signed) Evelyn Weidberg and six friends

Here's another:

> New York City
>
> Dear Miss Brainard:
>
> I had the pleasure, last evening, of hearing you speak over the radio on your new idea of reviewing the New York plays.
>
> It seems such a splendid way of telling people about the good plays, and letting them know just enough about each one to pique their curiosity into wanting to see every one you talk of.
>
> I had little interest in "The Goldfish" until Friday evening when you told the plot of it.
>
> Cordially yours,
>
> (signed) Ruth D. Champenois,
> Ass't Editor Good Housekeeping

So much for the initial attempt of "Broadcasting Broadway." The newspaper, telegraph, cable—all have played their parts in the past to herald the fame of the theatres of Manhattan, and now comes the radio telephone standing at attention, as it were, and saying "present!" when the roll call of those forces which bow to the fame of New York's Gay White Way is made.

Radio Blesses Blind

(*Continued from page* 30)

crystal set and a single tube set, and conducted code classes for blind boys, who learned to copy commercial messages, including the various wireless press services. This was the most popular course of the institution, and is to be much expanded, using the Newark, Schenectady and New York broadcasting services as a basis, as soon as a donor can be found to contribute a loud speaker.

The other homes and workshops for the blind in New York City likewise intend to install apparatus. Most of them have secured promises of sets from various sources. In the meantime several blind boys have built their own crystal sets, which are operating entirely satisfactorily.

The same situation exists in the other large cities. The Maryland Institute for the Blind, in Baltimore, already has a set, and daily concerts from it are part of the curriculum. The paid readers in the Industrial Home in Chicago and at Jacksonville, Ill., are to be replaced by receiving equipment. From all parts of the country the sightless eyes of the blind are being turned hopefully to radio.

"Undoubtedly the greatest blessing to humanity occurring in this era is the use of radio equipment by blind persons," says Charles E. Comstock, of the Illinois State Department of Public Welfare.

Radio has become the all-seeing omnipresent eye of the blind.

Olga Petrova

(*Continued from previous page*)

It was to learn whether she believed that the radiophone will play an important part in the motion pictures of the future that I asked her in what way, if any, could the two assist each other.

"I do not believe that the radiophone will ever be used in connection with talking motion pictures," said the fascinating Petrova. "Such a thing is highly impractical, and too impossible to even mention.

"I do believe, however," she continued, "that radio will be an important factor in the development of interest in motion pictures. Nothing new was ever created that could drive out any other thing which had merit. If the radio drives out the motion picture, then it means that the motion picture has no fundamental merit, and it should go anyway.

"A thousand and one new inventions could come into the field and none of them could drive out any existing invention if it had merit.

"While the radiophone is still a fad, it is possible that the box office may be temporarily hurt, but this cannot last long, and the ultimate result will be that the motion pictures of the ones who come before the broadcasting audience will have greater pulling power."

Radiophones for Alaska

With the co-operation of the navy, radio telephones have recently been installed at several of the remote lighthouses in Alaska.

Some of the lightships are also equipped as radio fog-signal stations, with the new department of commerce system, used continuously during foggy weather to furnish accurate bearings to ships possessing the radio compass.

According to George R. Putnam, commissioner of lighthouses, radio should be a great boon in relieving the lonely and monotonous life of the faithful keepers at isolated stations both on lightships and at lighthouses. The keepers of the Alaska lighthouses at the entrance to Bering Sea remain at their posts for three years on a stretch; they have been without mail for ten months. At Tillamook Rock Light, off the Pacific coast, bad weather has prevented direct communication with the shore for periods of seven weeks at a time. On the offshore lightships supplies are received usually only once a month, and the tenders often work in remote localities.

Radio Popular in Paris

Wireless telephone concerts are gaining popularity in Paris, and the big department stores are offering this entertainment daily to their clientele. From the toy department of the Louvre or the furniture section of the Printemps, the visitors can hear, about six o'clock, concerts given at the central wireless telephone station of the Eiffel Tower.

One of the popular priced stores, the Palais de la Nouveauté, uses it as an advertising means, and has installed in the main hall of the store a huge horn with a very powerful receiving station, so that all the visitors in the hall can hear the concert and other communications as well.

Yvonne de Treville as Jenny Lind

"MUSICIANS and professional folk generally accept radio's contribution to their art because their personalities are transmitted to listeners. As they become convinced that each individual's interpretation is faithfully reproduced, they admit the new industry to art circles"

Is the Opinion of

Yvonne de Treville

as Expressed to St. John Martens

WHEN personality survives in the transmission of the voice by radio telephone then indeed does radio become a valuable asset to a music loving world; then can radio and the higher forms of musical expression such as the concert and the opera work together for mutual benefit.

That was the qualifying statement made by Yvonne de Treville, the grand opera prima donna who has sung in such opera houses as the Opera Comique of Paris, the Theatre Royale de la Monnaie, Brussels, and the Imperial Opera of Vienna.

She believes that, generally speaking, the personality is carried with the voice over the radio telephone—in a few instances she is sure that it is carried in that way—but whether that will be the case one hundred per cent of the time depends on the outcome of the present continual experimentation. She is certain that development over the radiophone will reach the point where transmission of the personality of the one who broadcasts is assured; then will the radiophone receive most serious consideration from the artists and in the eyes of those who appreciate really good music.

When I asked her about her experiences in singing at WJZ, she exclaimed:

"My broadcasting on that night reminded me very strongly of the period when I lived in Budapest before the war. I was to appear in the Royal Opera House at that time.

"My mother was with me in the city, but due to an illness she was confined to her bed in the local hotel where we were stopping. It seems that someone had conceived the idea of broadcasting the opera throughout the city for those who were unable to attend.

"I recall distinctly asking someone in the opera house what those funny little megaphone things were, stretched along the footlights on either side of the prompter's cage. In those days, you know, we had prompters, who stood on a level below the stage facing the actors but hidden by a canopy from the audience. These prompters followed the lines of the opera, and when the occasion arose, prompted some forgetful artists.

"This custom still survives in a few cases but, generally speaking, it exists no more. I do not recall exactly what answer I received, but I am under the impression that someone told me that they were transmitters into which the voices of the performers were carried, to be broadcasted throughout the city. I do know, however, that my mother, lying in bed at the hotel, clamped a pair of phones over her ears and was able to follow the opera from beginning to end. Each day that I appeared my mother heard me through this means. I do not know whether it was by wireless or by wires."

I explained to her that I was familiar with the experiment made in Budapest at the time and that it was entirely through the medium of wires. It was commercially an impractical method, so it did not last long.

It was probably the diva's fondness for travel which carried her into so many countries and taught her to sing in so many languages. She is one of a few prima donnas who can successfully cope with an opera in eighteen different tongues. Her home is in America, but during the past nine years she has been heard in Belgium, China, Austria-Hungary, Denmark, Finland, Russia, Spain, Sweden.

Then, not satisfied, her wanderlust took her to Egypt and Algeria, where she was induced to give some special performances.

On her arrival in Europe it proved no easy task to obtain a hearing, for she was considered a foreigner, despite the fact that her father was a Frenchman. She did succeed finally, however, in appearing in concert in Paris and from that time on her progress has been a steady and healthy one. Such famous virtuosi as Ysaye, Cesar Thompson, Kubelik, Gerardy and many others have given concerts with her.

It was in Stockholm that the prima donna first sang before what a generous republic still calls "royalty," the late king of Sweden having commanded her to appear at the palace. The young singer repeated over and over again the various formulae of address she was told she should use. All went well until the singer suddenly realized that it was getting late. Then, springing impetuously from the seat on which she had not dared to sit until invited to do so by His Highness, she exclaimed, as she would in any other drawing room:

"Eh bien, au revoir, Monsieur."

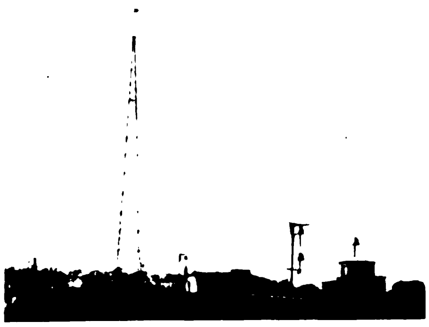
This, it is hardly necessary to tell my readers, is far from being the correct way to address a king; anyway it was a very bad break. But this king, it seems, was different. He laughed heartily, as not many kings in Europe are able to laugh today, and patted her on the cheek as he wished her goodbye.

The demon wanderlust still pursued the subject of our sketch and she flitted to Smyrna, Athens and Constantinople. Eventually she made her way back to her home land, and at the present time she is in New York City.

One of Yvonne de Treville's most popular songs is a laughing song which compels her audience to laugh with her. It was this song that she sang over the radio telephone. Friends of hers who listened in from various points within the range of WJZ, told her afterward that in the transmission of that laughing song the personality of the singer did not die. That those who listened as her voice came out of the loud speakers were compelled to laugh with her. And, in her opinion, that is proof of her theory that the apparatus does not kill the personality of the artist.

W G Y

The General Electric Broadcasting Station at Schenectady, N.Y., Described for the Many Fans Who Admire Its Radio Programs



What WGY station looks like on the roof, showing one of the high towers and two-wire aerial

A RADIO broadcasting station, in order to transmit music and other forms of entertainment faithfully, must be equipped with specialized apparatus of very high quality. In the WGY station of the General Electric Co. at Schenectady, N. Y., particular reference has been paid to this point with the result that the radio equipment contains numerous important refinements. When radiophone apparatus first came into more or less general use several attempts were made at broadcasting music and while many of these tests were quite successful it was found that equipment that would give satisfactory speech quality was not always particularly suitable for music transmission. Consequently a large amount of experimental work was done to improve the quality of transmission with the result that both music and voice are now faithfully reproduced.

Contrary to the general opinion of the public, the radio transmitting apparatus and the studio where the artists perform are not located in the same building but are about three-fifths of a mile from each other. Such an arrangement allows considerable flexibility as it is possible to broadcast programs not only from the studio but also from any point that can be connected to the studio by a telephone line.

The transmitting apparatus proper at WGY is located on the top floor of one of the factory buildings. A multiple-tuned antenna has been erected on the roof of this building. The antenna is 350 feet long and is supported at each end by a steel tower 180 feet high. A counterpoise system has also been installed a few feet above the roof. This consists of a network of wires that act as a ground and results in a considerable decrease in the effective resistance of the whole antenna system.

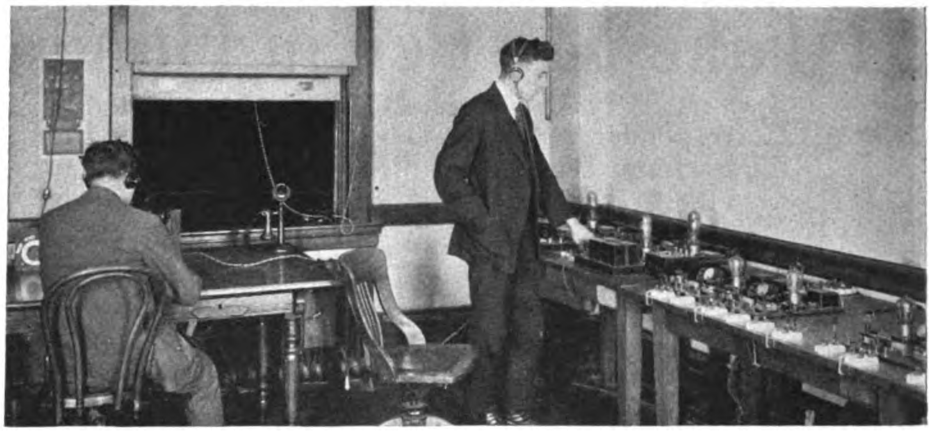
Mlle. Besnier and Max Merson of the Ladony Opera Concert Co., giving a recital at WGY. In the background is Robert Weidaw, an announcer, at the switch controlling the microphone circuit

Two fundamental conditions must ordinarily be fulfilled in order to operate a radio telephone transmitter. First it is necessary to supply the antenna system with high frequency energy. Secondly means must be provided to control or modulate this high frequency energy in accordance with the speech or other audible vibrations that are to be transmitted. The wave length used at WGY is 360 meters. This corresponds to a frequency of approximately 833,000 cycles. The manner in which alternating current of this frequency is produced by the transmitting apparatus may be described as follows:

The power supply for the transmitter is alternating current, three-phase, 60 cycles, at a potential of 110 volts. This source furnishes practically all the power for the entire equipment. Two types of vacuum tubes are used, namely, Kenotrons or two-element tubes and Radiotrons or three-element tubes. The filament of the Kenotron is heated from the secondary of a step-down transformer. A direct current motor-generator set is used to supply the Radiotron filaments.

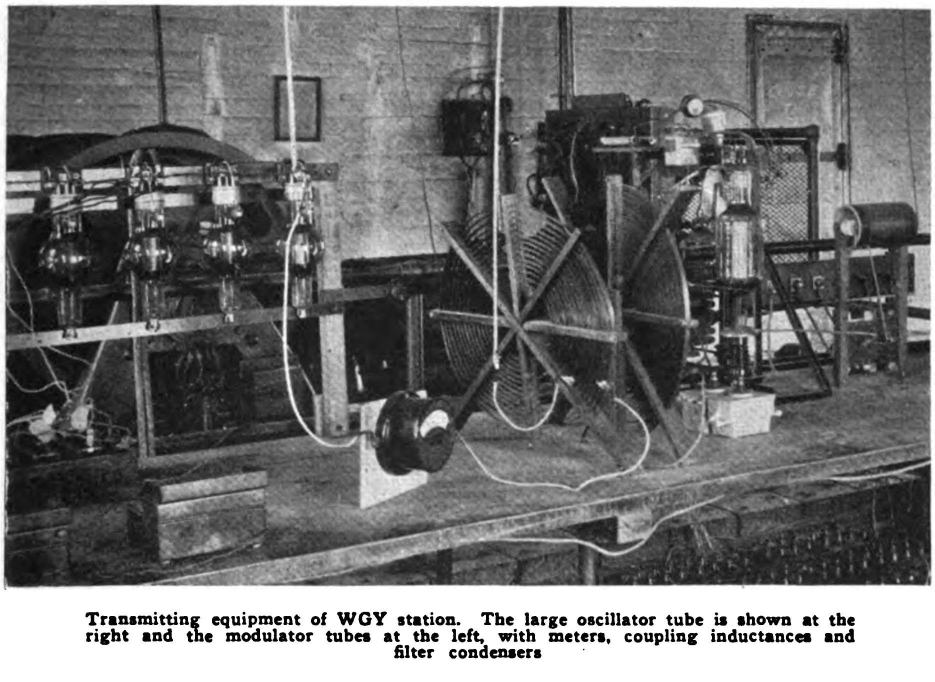
The plate circuit of the Radiotron power tube requires high voltage direct current at a potential of about 12,000 volts. This is obtained from the Kenotrons which are connected through a suitable rectifying circuit to the secondary of the high voltage plate transformer. A filter system is connected in the rectifying circuit in order to remove the alternating current hum that would otherwise be present. The high voltage output of the Kenotron rectifier then passes into the Radiotron tubes, where by means of the proper oscillating circuits it is converted into radio frequency energy. The oscillating circuits are coupled to the antenna system by means of an air core transformer, commonly known as an oscillation transformer. Therefore, by means of the vacuum tubes and their associated circuits the station is able to take alternating current at 110 volts and 60 cycles and convert it into radio frequency power at several thousand volts and practically any desired frequency.

In order to understand how the modulation or audio frequency control of the antenna current takes place we must begin at the studio where the artists perform. Three rooms are utilized at the studio, one being used as a reception room, one containing pianos, organs and other musical instruments and the third containing the controlling and amplifying apparatus. The only radio apparatus located in the room where the artists perform are small microphones, which are mounted on stands so that they may be placed in the best position for the particular selection to be broadcast. These microphones have been very carefully designed so that the true tone qualities of music and voice will be clearly reproduced. The minute electric currents set up in the microphones are then transferred to the apparatus room where they pass into amplifiers. Various controls are provided on these amplifiers so that the intensity of the transmitted selection may be varied at will. There is then available at the output terminals of the last amplifier a fairly strong electric current that varies in exact accordance with the sound waves impressed on the microphone in the studio. This current is next transmitted over a pair of wires to the modulator tubes located in the transmitting station proper. These modulator tubes are so connected that they may control the antenna current by varying the plate potential impressed on the oscillator tubes. Consequently we have a system of modulation that enables comparatively feeble sound vibrations to control or mould large amounts of radio frequency energy.


Control room adjoining the studio of WGY, the General Electric broadcasting station. It is here that the censor works and all electrical details are under constant supervision

The censorship and supervision that is exercised by the men in charge of the broadcasting equipment is of some interest. The studio director has at his disposal a control switch that cuts the microphones in or out of the circuit. As soon as this switch is closed a red lamp is illuminated which warns those in the room that everything spoken will be transmitted to the invisible audience. The "censor" or man in charge of the amplifiers in the apparatus room listens continually to the concert or selection being broadcast so that he may make any adjustments necessary to improve the tone quality of the transmission. The censor is also in telephone communication with the operator of the transmitting equipment. The latter keeps a constant watch on his apparatus and by means of an oscillograph can determine the amount of modulation that is taking place in the antenna circuit. All circuit adjustments are, however, under the complete control of the censor and no changes are made without his consent.

All broadcasting of the General Electric Company at WGY is under the direct management of Martin P. Rice, who is manager of the publication bureau of the company. It has been Mr. Rice's theory that the privilege of furnishing entertainment to thousands carries with it the responsibility of affording the radio public good music and of providing addresses of an informative and interesting nature.


Transmitting equipment of WGY station. The large oscillator tube is shown at the right and the modulator tubes at the left, with meters, coupling inductances and filter condensers

Kolin D. Hager is studio manager of WGY and also the chief announcer, for which work he is peculiarly fitted. Trained for the operatic stage, he speaks French, Italian and German; his speaking voice is pleasing and the radio fan, in commenting on the programs, frequently refers to his voice.

WGY is offering concerts three nights a week, Tuesday, Thursday and Friday and nightly, except Saturday and Sunday, furnishes produce and stock market reports, baseball results and news bulletins. Every Friday night a special late program is given at 10:30 o'clock Eastern time.

The General Electric Co. broadcasting station at Schenectady provides radio entertainment for the New England states, south-eastern Canada and west through Wisconsin and Illinois, south to South Carolina and Tennessee. This territory may be conservatively stated as the nightly range of the station, excepting for those sections which are close to other powerful transmitting stations. The station is often heard at much greater distances, however, and WGY's mail contains many letters from Florida, Texas, the middle Western and Rocky Mountain states.

Among the distance achievements reported was the receipt of WGY entertainments by the S.S. *Harry Luckenbach,* on March 30 of this year, when the ship was 7 degrees north of the equator and directly south of Panama in the Pacific Ocean. The log of the ship's operator checked with that of WGY and was verified by the master of the ship.

The Rockridge station at Oakland, Cal., reported perfect reception of voice and music on the night of March 24.

Among the interesting distance reports was that received May 5 from Elmer F. Barber, an amateur, who reported getting WGY at St. John, Washington, on a home made receiver, using only one bulb.

"I Take My Pen in Hand to Tell You—"

Correspondents Report Their Pleasure and Profit in Broadcast Programs. Each Home Finds New Reasons for Listening In. Gratitude Moves Many to Express Their Appreciation in Written Words of Thanks

Camp Bragg, N. C.

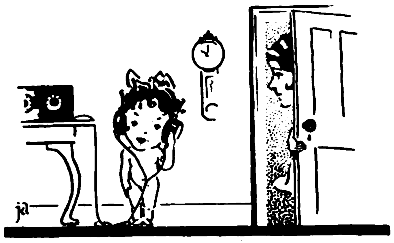
For some time past I have followed with great interest the developments in radiotelephony and have recently acquired a receiving set. Myself as well as all of my friends stationed here at this camp are greatly benefited by it and it has become a regular hobby of all personnel at this place. Married men are bringing their families for entertainment during the evenings and young and old are enjoying it immensely.

Camp Bragg, N. C., our station, is approximately eleven miles from the nearest town, Fayetteville, N. C. Fayetteville has a population of about 8,000 and is not offering much to our men in the line of amusement and diversion—consequently we are always on the lookout for any new form of entertainment. Radio telephony has solved the problem. There are about 3,000 officers and enlisted men and about 300 families here. My set is the only one in the hands of and for the amusement of enlisted men. ALFRED HAHN.

Bridgeport, Conn.

I "listen in" on your concerts at my home in Stratford, Connecticut, and, while I can't answer back, I assure you of my appreciation.

An ex-service man (a Captain in the 42nd Division) was visiting me Sunday night and was much interested in Major Charles R. Morris' lecture.



Last night my wife found our ten-year old daughter oblivious to everything except the concert. The child was supposed to be getting ready for bed so mother was censorious. They compromised upon daughter both listening and getting ready for bed. Again mother hunted up daughter, found her still oblivious to earthly affairs but clothed only with a pair of ear 'phones. H. L. LEWIS.

Send your impressions in the form of a letter to The Wireless Age. Be sure to tell about your more interesting and unusual experiences. Write on one side of the paper, not over 300 words. Address them to Letter Editor, Wireless Age, 326 Broadway, New York City.

Garfield, N. J.

On Sunday and Monday nights we heard your request to have all people who have radios to write you.

As ex-chief of the Fire Dept. I was at the headquarters of Co. No. 2 where a radio is in working order.

I must say all of the firemen including myself heard the band concert and I thought the way the men acted someone might take the radio home with them.

The invention is wonderful and I must give you all the credit my power can give you for your speaking and programs you send out.

On Sunday evening, our entire department will be on hand to hear you.

CHAS. H. LOHSEN,
Ex-Chief, Fire Dept.

Morris Plains, N. J.

We listen most every night to your wonderful entertainments and I am sending you these few lines to thank you for the pleasure you give our family.

We heard the Ed. Wynn show and it came in very clear. We get all of your stuff quite clear—in fact we can hear the needle go down on the records whenever you play one and my wife said she heard the organ stool being moved yesterday when the organist finished playing.

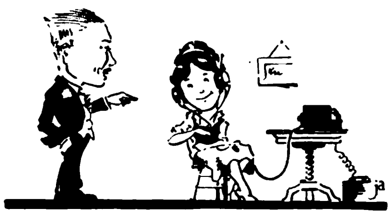
Had my father down yesterday. He is 75 years of age and he thinks it is a wonderful thing. I don't know how I can repay you for your entertainment as our machine is as large and good as we want, but I am a booster for WJZ and whenever I can interest a customer of mine in radio I shoot him full of the great possibilities for making money by installing your instruments.

WM. M. SUMMER.

Springfield, N. J.

Extract of letter to Miss May Peterson

We have just heard you finish your program and tell your unseen hearers that you have enjoyed yourself "immensely." We—my husband and I—would like you to know what delight we had in your singing tonight. The "Echo" song and the "Cuckoo Clock" song were novel and realistic and we enjoyed them very much; but your "Carry Me Back to Old Virginny" and "Last Rose of Summer" were sung with such expression, sentiment, and sweetness, that we derived the greatest pleasure from them.



It may interest you to know that for years I have been hard of hearing and have been deprived of the enjoyment of all soft or faint melody. Yet, tonight, over the wireless I "got" every note you sang, even to the faint dying away of the last note of the "Last Rose of Summer."

We also enjoyed the piano solos very much, especially the Chopin number. It is a pity that the artists rendering programs over the wireless cannot hear the "silence" applaud. We always clap our hands.

MATHILDE M. HORSTER.

Jersey Shore, Pa.

I write you to express my appreciation of your excellent service that I have had the pleasure of listening in on for the past week. Your programs, the last three nights, have been exceptionally good and have been enjoyed by perhaps twenty people besides myself at my home. The misfortune of having to take you on at six instead of seven o'clock, on account of the failure of our legislature to help make daylight saving uniform, is a bit of a handicap to us, but will be in on it just the same.

L. M. GOODMAN.

Byron G. Harlan

"I WOULD like to shake hands with every one of my radio audience. As that's impossible, I am more than pleased to greet them through THE WIRELESS AGE." *So said the man who has made millions laugh*

Edwin Hall Interviews

Byron G. Harlan

Whose Humorous Songs and Stories Have Won Fame on the Stage, on Talking Machine Records and Now by Radio

TWENTY years ago Byron G. Harlan, making his bow to the public as a singer, thought he could best achieve lasting fame by making people cry. So he sang baby songs and other sentimental pieces. And now the twenty years have flitted into the never-returning past and Byron G. Harlan still is singing to the public through thousands of talking machine records. His fame has spread into all countries during this time, but it is not the fame of which the singer once dreamed.

He does not make them cry. Any desire to do that fled years ago. All his efforts now are directed toward making people laugh, and many hundreds of thousands of radio telephone users will readily testify to his success.

Although Mr. Harlan has broadcast several times and "knows" his audience as well as any entertainer, he welcomed the interviewer, who wished to present him to the radio audience in printed word and picture.

"I'd like to shake hands with every one of them," he said. "I'm also glad of the chance to let them see what I look like, for many of them have written me asking for photographs.

"I am quite certain," and here he grew serious, "that the radiophone will be taken up by such agencies as the church for the teaching of the gospel. Who knows but that it is the force sent down to man by God for the spread of the message of the Bible!

"At heart, people are good. But they do many things that are thoughtless, and cause pain to others. Simply because they forget. That is why we need the voice of the church—to remind. But unfortunately many do not go to church. What must we do then? Why, it is simple—we must bring the church to them.

"That is where radio will play its part. It will bring the church into the home. It will be a remarkable power for good.

"I could sense its power by my experiences in broadcasting. The rebounds of my laughs across the air were tremendous. I have heard from nearly every state in the union east of the Mississippi."

Uncle Josh and the Wireless

As Spoken by Byron G. Harlan

Quotations from the talking machine record of that title. Copyright 1922 by Ring-Hager.

ABOUT two weeks ago my brother-in-law, Squire Abner Witfield, bought one of those new fangled radio sets, from a mail order house in Chicago.

A few days later he strung wires from the two poles, upon the roof of the old homestead.

Well, Sir, last Wednesday night he invited all Punkin Center to a radio party, and you never saw such a conglamaration of small town skeptics in all your life.

Well, Sir, after he had us all seated he pulled a lever, and the darn thing started to sputter and spark, and everybody started to giggle; and Lem Johnson wanted to know if we were going to have fire works or movies, ha, ha, ha!

Finally, after the darn thing got tamed down, all the wiseacres that claim Missouri as their native state, got the surprise of their life.

The room was filled with the sweetest music I ever heard, and a girl called Jean Neilson, known as the radio girl, sang a song called "Kiss Me by Wireless," ha, ha! It was the cutest thing I've heard in many a day. Everytime she would come to the chorus that silly old fool Chett Green would deliberately walk up to the horn, and smack his lips, Hank Walton, the village wit, said if Jean Neilson's lips are half as sweet as her voice, she wouldn't have to plead long to be kissed in Punkin Center, ha, ha!

Abe Martin said he never saw a clothes line in such a ridiculous place before in all his life. Aunt Polly said maybe Abner was going to be one of their circus fellers, and do a little wire walking as a side line. Obidian Green, the town evangelist, said it was some new invention of the devil, and Abner looked as if he was on the way to perdition, whatever that is, ha, ha, ha!

Radio listeners as well as phonograph users have come to know Mr. Harlan as an extremely versatile artist. He sings "rube" songs; "Cousin Caruso," Italian comics; and negro dialect songs with equally good effect.

Since the death of Cal Stewart, the original "Uncle Josh," Mr. Harlan has been assuming this character role, and in another column the reader will find extracts from the latest "Uncle Josh" Okeh records made by him—"Uncle Josh and the Wireless." These Uncle Josh monologues, which radio audiences have come to like, are spoken and not sung.

LIFE ON THE FARM

Mr. Harlan's singing partner, during his entire career has been, and still is, Arthur Collins, and the team of Collins and Harlan is very famous.

Physically, as well as in his own world of song, Mr. Harlan is a big man. This he credits to early life in South Dakota, where he was born and raised on a farm. It was while at the plow that he first aspired to become a singer. Up and down the field he would trudge, slowly behind the oxen, singing all the time.

People stopped along the roadside to hear him; and it was their interest that encouraged him to go on to greater triumphs.

Finally the old homestead was sold and his father bought and operated a hotel in Canton, in the same state.

His first public appearance was with his present partner, Arthur Collins, who hailed from a small town called Hempstead. From the successes of those early days the team of Collins and Harlan progressed by leaps and bounds, winning collective and individual honors everywhere, first by the phonograph, and recently via radio.

What Newspaper Editors Say

Writers Comment on the Danger of Political Campaigning by Radio Spoiling the Public Taste for Broadcasting

THE Summer months are here and soon it will be Fall. Then politics—campaign—elections. From one figurative end of this country to the other whispers are being heard as to how extensively the radio telephone will play its part in the elections, local, state or national, of the future. Probably this Fall will indicate which way the wind will blow; that is, how eagerly the politician will seize upon the radiophone as a means of acquiring votes.

Thus runs the trend of thought in the columns of the nation's daily newspapers—columns devoted both to radio and to politics.

Many of the newspapers treat the subject humorously. Others are quite serious.

Under the heading, "The Radio in Politics," the *Milwaukee* (Wis.) *Journal* says editorially:

> We might have known there was a catch somewhere in this radio business. Getting music out of the air and market reports from an ethereal ticker was too good to be true. Senator New has gone and crabbed the whole thing. He sat in his office in Washington and stump-speeched, smearing prideful points all over the map of Indiana.
>
> When a candidate hires a hall there's no law to make you go hear him. If a paper prints his speech, you can skip it and read something interesting in the next column. Usually you can dodge him on the street. But when he takes to the radio, he's got you. With the radio in the office, the club, the home and the bathtub, on boats, trains and automobiles, there's no escape from the spellbinder.

Along the same line of thought appears the editorial in the *Toledo* (O.) *News-Bee,* commenting in light vein on a bill introduced in Congress:

> Some Congressman has introduced a bill for having all the proceedings of Congress sent out by wireless.
>
> We vote no!
>
> One can let the *Congressional Record* lie in its wrapper. Or one can find out when something worth while has been said, and read that. For there is lots of good stuff in the *Record.*
>
> But in the place of the music, the lectures, market reports, weather reports and things of this sort, the congressional proceedings as a whole are not worth the time.
>
> Nobody but the man who is paid for it should have to stand the racket of Congress.
>
> A second time we vote no! When congressmen want to do their electioneering, let 'em hire a hall.

The *New York Times* doubts whether a political speech could be transmitted with satisfactory effect upon the listeners—satisfactory at least on the part of the politicians. It thinks that the success of a political speech is dependent largely "on the addressing of it to auditors, most of whom already are convinced."

Continuing, it says:

> It is not at all obvious why protest should be made by candidates for office because it has been decided not to "broadcast" their appeals for votes from the Government radio stations. On the other hand, however, it is not obvious why business of this sort, if offered on a business basis, should not be accepted.
>
> What is obvious is that the rendering of such service at a Government station might be influenced by partisan considerations, and fairness in the granting of facilities might not always be maintained. If it were not, there would be both moans and growls.
>
> Perhaps the public would like to get political speeches this way and perhaps not. People would not ever become wildly excited over appeals coming from an unseen orator, and most of the effects produced on assembled crowds would be unattainable, for there would be none of the enthusiasm due to contagion, and there might be a dangerous pondering over the arguments offered—dangerous to the candidates, that is.
>
> The success of a political speech is largely dependent on the addressing of it to auditors most of whom already are convinced. That can be done at a "rally," but there would be no selection by radio.

Calling Senator New's experience of broadcasting his speech by radio interesting as an experiment, but horrible as an example, the *New York Tribune* contends solemnly that the pleasure of the evening group around the fireside would swiftly turn to consternation were music and lectures and market reports interspersed with pleas of politicians seeking re-election.

Then it goes on to say editorially:

> Furthermore, were the practice to become general, it would be impossible for even the most modern apparatus to strain out of the New York radio canvass the speeches broadcast to Iowa, Oregon, Michigan and Louisiana. And good Republicans, interested only in addresses calculated to supply them with campaign arguments, would be forced against their wills to hear dozens of reasons why Democrats should be supported. And they could not even "boo" their disapproval.
>
> The radio is rapidly adding entertainment and instruction to the household, and that is about enough for the present. When it begins to supply political opinion as well, many of the partisan listeners will open the lightning switches and cut off the unwelcome voices.

Entirely aside from politics there is another point that is of interest to newspapers throughout the country in connection with radio during the Summer months, and that is reflected in the press of the land.

We refer to the Summer camps, and the new note that has been added this year—radio. Thousands of these Summer camps dot the coasts, the lake fronts, the rivers in the northern wilds. And this year, the editors point out, few of them will be without their radio sets, to brighten the life of the camp, to keep the folks in touch with the sweltering world outside from which they sought to escape.

Heat drives people to cooler climes, but it only has the effect of making radio all the more popular in Summer camps. For where present day civilized man is, there will one find the radio telephone.

That is the gist of editorial comment of the press of the country now. The *Providence* (R. I.) *Journal* suggests that, if the demands made upon it are not too great, the battery in a vacationist's automobile may be made to serve admirable duty with the radiophone.

Heading the passage "Vacation Radio," the newspaper says editorially:

> One noticeable change in the landscape at Summer resorts is the presence of aerial wires. Several have already been seen, and many people are considering the installation of receiving outfits in their houses down the bay and on the seashore.
>
> The conditions for reception at shore resorts are excellent, oscillations from transmitting stations having greater range over the water than over the land. There are no extensive power lines to increase outside interference to the reception of signals.
>
> The difficulty is in the transportation of the apparatus, particularly of the filament battery. The same problems present themselves in this case, as they do in vacuum tube sets at home. Crystal detector sets can be used, but their limited range works against them.
>
> It is possible to use the automobile starting battery for filament lighting purposes. In summer an automobile battery generally gets overcharged because the demands for starting are less than in winter, and there is less driving at night. Excessive overcharging is harmful to a battery, and the use of the battery for radio purposes will keep it in good condition if the demands on it are not too great.

The *Louisville* (Ky.) *Herald* points out that Summer months are not ideal for radio reception, but it predicts that when the Fall rolls around again the interest in radio will be much greater than ever before. It says:

> Look for a drop in radio enthusiasm during Summer.
>
> Then for a recurrence of interest in fall, even greater than ever.
>
> That's the prediction of radio engineers and officials.

In The War Zone

Adventures of George N. Soupos, Wireless Operator, During the Graeco-Turkish War

"His Knowledge of the Greek Language Obtained for Him a Job on the Themistocles"

If you had been a wireless operator aboard a Greek troop transport and your ship had taken an active part in a successful battle against the enemy and you, especially, had distinguished yourself by some particular feat so that Queen Olga of Greece would personally ask you if there was anything in the world you would like to have—what would you say?

That is what actually happened to Operator George N. Soupos of New York City, an adventurous lad, who, a victim of circumstances, found himself one day in the storm center of the war between Greece and Turkey some few years ago.

And George N. Soupos said that the only thing he wanted was some potatoes mashed with plenty of cream.

This was a favorite dish of the young operator before he heard the call of adventure—*potatoes a la Soupos*—as he styled the dish which was his favorite delicacy.

The story of young Soupos is another tale of adventure plucked from the life of that fearless group of American youths—the wireless operators. The youngsters just starting into the wireless operating business like to speak of his adventures, but it is a safe guess to say that there is no operator of experience today who cannot duplicate—as far as excitement and thrills go—the story related on this page.

Used Spare Time

When he was eighteen years old Soupos was an aspiring wireless amateur and devoted as many minutes as he could spare to acquiring knowledge about wireless by experimenting in his little station in his home. Within one brief year he was returning home, a war veteran, for in a few months of fighting in the Aegean Sea for the liberty of Greece, he had taken part in minor battles and one big naval engagement; he had saved his vessel from destruction on several occasions, and once he had been in irons awaiting execution.

It was because of his knowledge of the Greek language that he obtained a job as wireless operator on the *Themistocles.* It was a ship carrying Americanized Greeks back to their native land. They were going back to fight and every one of them continually sought young Soupos on the trip over when knowledge was wanted of what was going on in the war-ridden land they were approaching.

Remained With Crew

After the vessel had deposited the passengers at Piraeus, Greek naval officers told the captain of the *Themistocles* that arrangements had been made by the owners of the boat to convert it into a transport for Greek naval service.

The captain, his officers, and the young wireless operator remained with the ship. Steel plates were bent about the bridge of the vessel and four-inch guns were mounted on her decks.

On one occasion Soupos was startled by hearing a spark station in operation. It sounded like a Turkish station, and seemed very close. So he reported it to the captain, who discovered he was out of his course and ordered all lights extinguished. The vessel steamed ahead under forced blast away from the danger zone. Searchlights from a nearby Turkish fortress played upon the water and the twelve-inch guns of the Turks would have made short work of the vessel had they discovered its presence. For this service, Soupos was rewarded with a lieutenancy.

The following days were marked by skirmishes with the Turks and during one of the lulls between battles, an attempt was made by the enemy to bribe the young operator into betraying secrets of the Greeks. Young Soupos, of course, refused, but he was ordered to "string along" the one who had made the offer, and it was not long before the officers knew that another operator had accepted what young Soupos refused. That operator did not operate long.

Soupos likes to tell about the chase in which his vessel was the one pursued. One day he caught a Turkish spark and again the captain, on searching the horizon with his glasses, discovered he was too close to an enemy ship for comfort. The Turkish armor-clad vessel took up the chase, and it was not until the *Psara* of the Greek Navy hove in sight that the Turkish boat abandoned the chase.

The captain of the rescuing vessel was under the impression that young Soupos should have detected the presence of the Turkish boat before he did and he calmly told the lad that he would be executed.

The captain of his vessel proved a friend and persuaded the irate officer that Soupos, being an officer, could not be executed without a court martial and should the execution take place, he would request an investigation. After a night in the brig, Soupos was released.

Longs For Home

Eight months of battle smoke and very many narrow escapes found Soupos longing for his home in New York City. A conversation by wireless with the operator on board the U. S. S. *Virginia,* opened up anew the floodgates of his homesickness. He asked for a discharge and received it. A wireless message to his mother told her that he was on his way back home, and there was a proud mother waiting for her returning hero when his vessel docked under the shadows of the metropolitan sky scrapers.

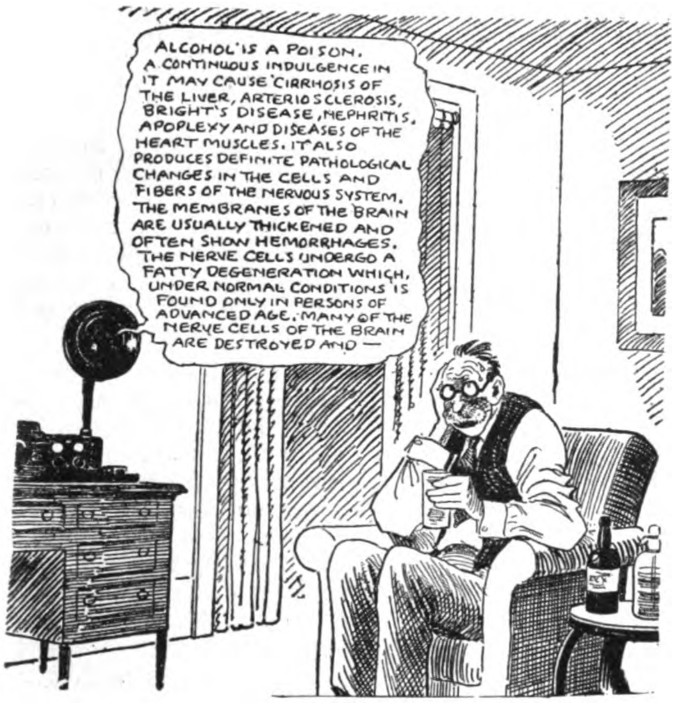
The shadows of night were falling as Soupos mounted the steps of his home. Supper was on the table and the sight of the familiar faces and a certain bowl of food on the table made the lad realize that once more he was safe.

What do you think it was that his mother had prepared for him?

It was a bowl of potatoes mashed with cream!

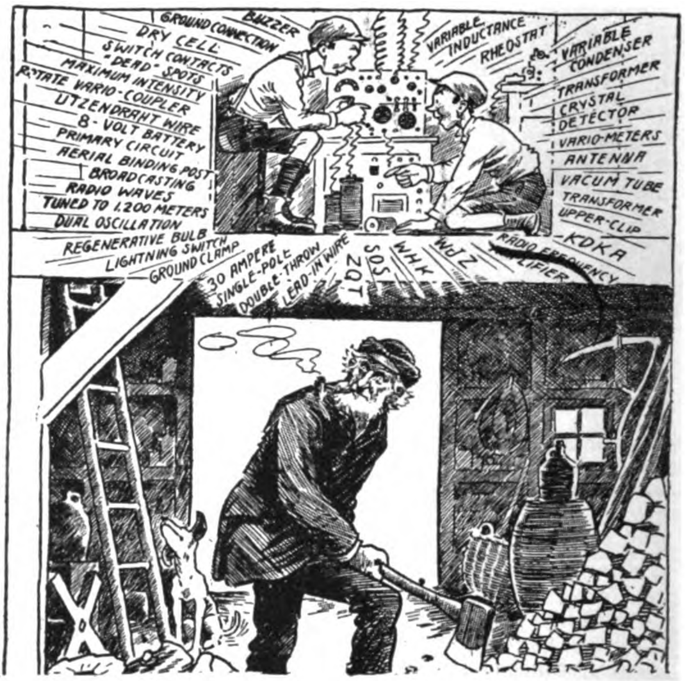
When The Radio Bug Clashes With The

THE RADIO TEMPERANCE LECTURE


ALCOHOL IS A POISON. A CONTINUOUS INDULGENCE IN IT MAY CAUSE CIRRHOSIS OF THE LIVER, ARTERIOSCLEROSIS, BRIGHT'S DISEASE, NEPHRITIS, APOPLEXY AND DISEASES OF THE HEART MUSCLES. IT ALSO PRODUCES DEFINITE PATHOLOGICAL CHANGES IN THE CELLS AND FIBERS OF THE NERVOUS SYSTEM. THE MEMBRANES OF THE BRAIN ARE USUALLY THICKENED AND OFTEN SHOW HEMORRHAGES. THE NERVE CELLS UNDERGO A FATTY DEGENERATION WHICH, UNDER NORMAL CONDITIONS IS FOUND ONLY IN PERSONS OF ADVANCED AGE. MANY OF THE NERVE CELLS OF THE BRAIN ARE DESTROYED AND —

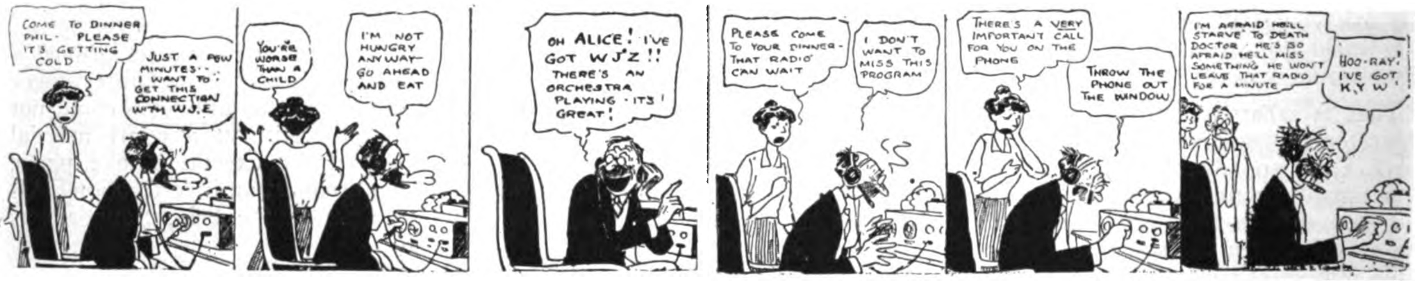
Richmond (Va.) Evening Dispatch

GRANDPA HEARS A STRANGE LANGUAGE



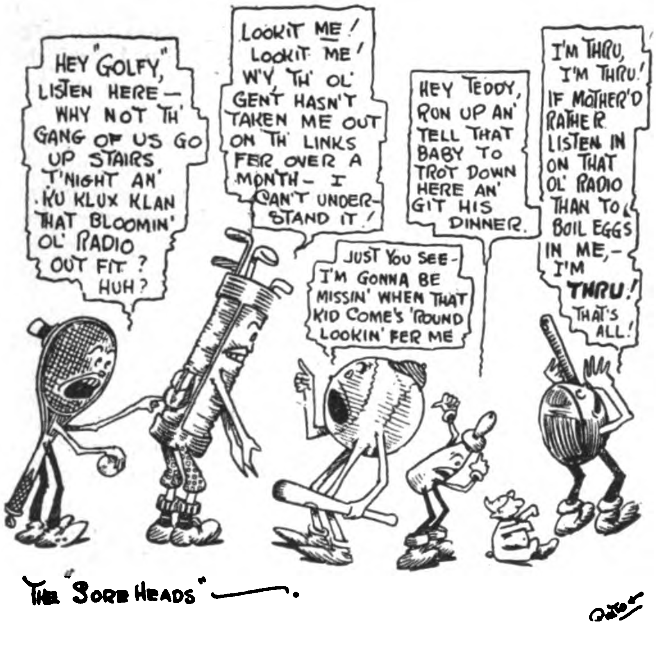
—By Cartoonist Bushnell

AND THEN HE TOOK UP RADIO


COME TO DINNER PHIL - PLEASE IT'S GETTING COLD
JUST A FEW MINUTES - - I WANT TO GET THIS CONNECTION WITH W.J.Z
YOU'RE WORSE THAN A CHILD
I'M NOT HUNGRY ANYWAY - GO AHEAD AND EAT
OH ALICE! I'VE GOT WJZ!! THERE'S AN ORCHESTRA PLAYING - IT'S GREAT!
PLEASE COME TO YOUR DINNER - THAT RADIO CAN WAIT
I DON'T WANT TO MISS THIS PROGRAM
THERE'S A VERY IMPORTANT CALL FOR YOU ON THE PHONE
THROW THE PHONE OUT THE WINDOW
I'M AFRAID HE'LL STARVE TO DEATH DOCTOR - HE'S SO AFRAID HE'LL MISS SOMETHING HE WON'T LEAVE THAT RADIO FOR A MINUTE
HOO-RAY! I'VE GOT K.Y.W!

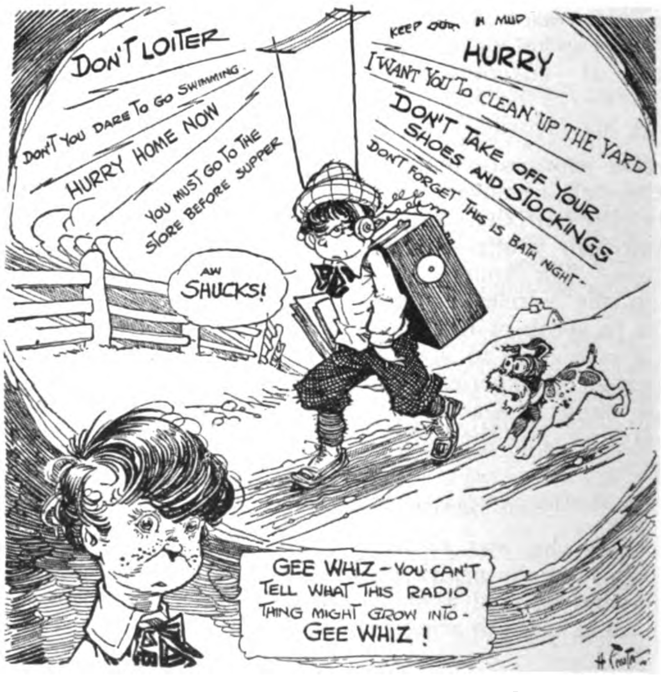
—N. Y. Tribune

LIFE ON THE RADIO WAVE


HEY "GOLFY," LISTEN HERE — WHY NOT TH' GANG OF US GO UP STAIRS T'NIGHT AN' KU KLUX KLAN THAT BLOOMIN' OL' RADIO OUT FIT? HUH?
LOOKIT ME! LOOKIT ME! W'Y, TH' OL' GENT HASN'T TAKEN ME OUT ON TH' LINKS FER OVER A MONTH — I CAN'T UNDERSTAND IT!
HEY TEDDY, RUN UP AN' TELL THAT BABY TO TROT DOWN HERE AN' GIT HIS DINNER.
JUST YOU SEE — I'M GONNA BE MISSIN' WHEN THAT KID COME'S 'ROUND LOOKIN' FER ME
I'M THRU, I'M THRU! IF MOTHER'D RATHER LISTEN IN ON THAT OL' RADIO THAN TO BOIL EGGS IN ME, — I'M THRU! THAT'S ALL!
THE "SORE HEADS" —.

—San Francisco Chronicle

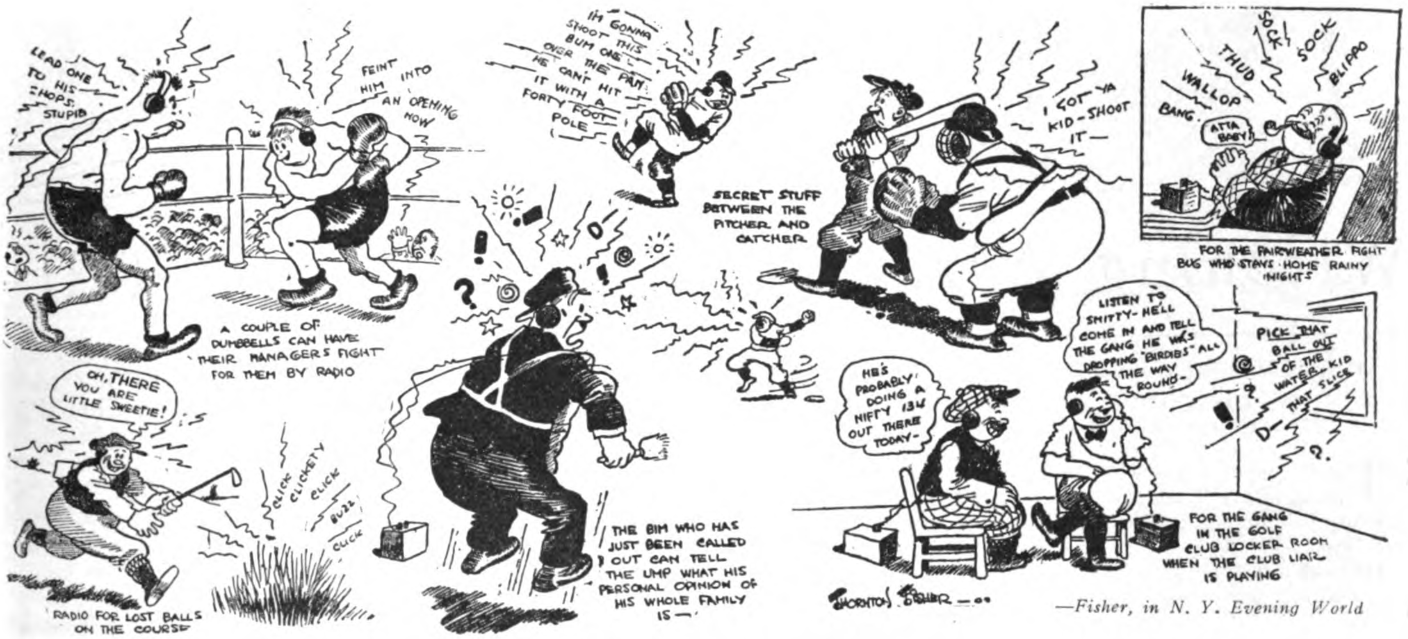
MERRILL SHUDDERS AT THOUGHT OF IT


DON'T LOITER
DON'T YOU DARE TO GO SWIMMING
HURRY HOME NOW
YOU MUST GO TO THE STORE BEFORE SUPPER
KEEP [illegible] MUD
HURRY
I WANT YOU TO CLEAN UP THE YARD
DON'T TAKE OFF YOUR SHOES AND STOCKINGS
DON'T FORGET THIS IS BATH NIGHT
AW SHUCKS!
GEE WHIZ — YOU CAN'T TELL WHAT THIS RADIO THING MIGHT GROW INTO — GEE WHIZ!

—Atlantic City Gazette

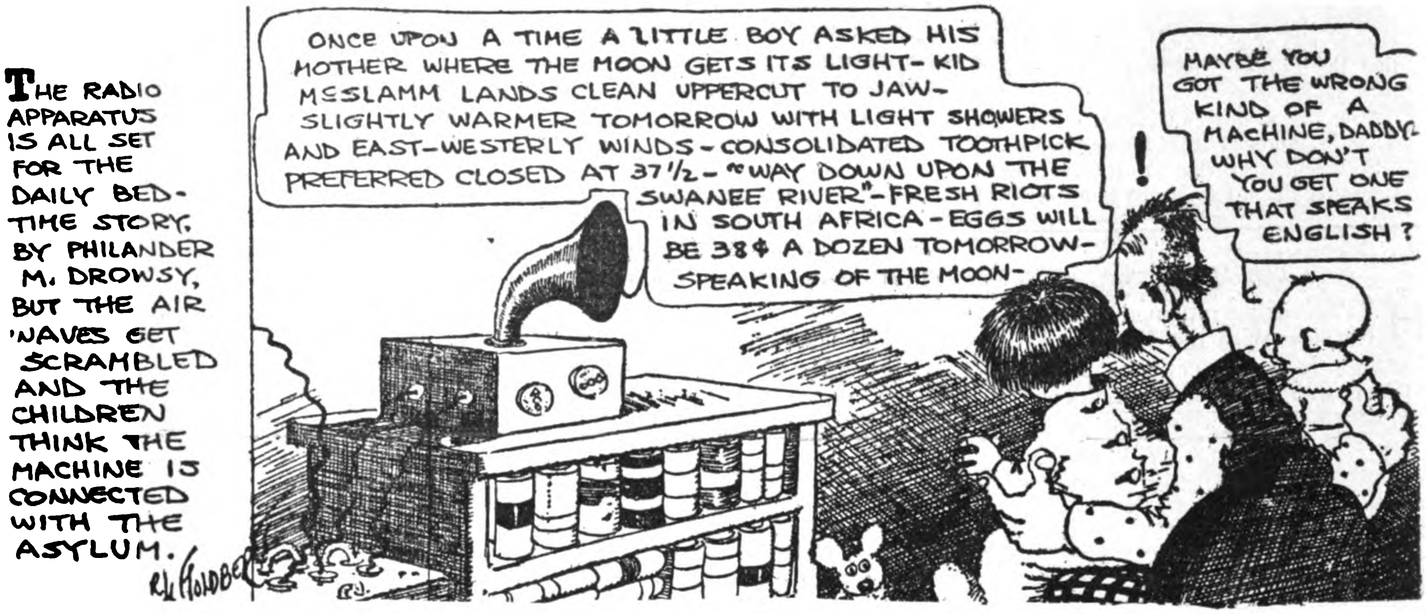
Cartoonist's Wit Sparks Are Bound To Fly

PLAY IT WITH RADIO


LEAD ONE TO HIS CHOPS STUPID
FEINT HIM INTO AN OPENING NOW
A COUPLE OF DUMBBELLS CAN HAVE THEIR MANAGERS FIGHT FOR THEM BY RADIO
I'M GONNA SHOOT THIS BUM ONE OVER THE PAN HE CAN'T HIT IT WITH A FORTY FOOT POLE
SECRET STUFF BETWEEN THE PITCHER AND CATCHER
I GOT YA KID - SHOOT IT —
SOCK
THUD
SOCK
BLIPPO
WALLOP
BANG
ATTA BABY!
FOR THE FAIRWEATHER FIGHT BUG WHO STAYS HOME RAINY NIGHTS
OH, THERE YOU ARE LITTLE SWEETIE!
CLICK CLICKETY CLICK
BUZZ
CLICK
RADIO FOR LOST BALLS ON THE COURSE
THE BIM WHO HAS JUST BEEN CALLED OUT CAN TELL THE UMP WHAT HIS PERSONAL OPINION OF HIS WHOLE FAMILY IS —
HE'S PROBABLY DOING A NIFTY 134 OUT THERE TODAY -
LISTEN TO SMITTY - HE'LL COME IN AND TELL THE GANG HE WAS DROPPING "BIRDIES" ALL THE WAY ROUND -
PICK THAT BALL OUT OF THE WATER KID THAT SLICE
FOR THE GANG IN THE GOLF CLUB LOCKER ROOM WHEN THE CLUB LIAR IS PLAYING
THORNTON FISHER

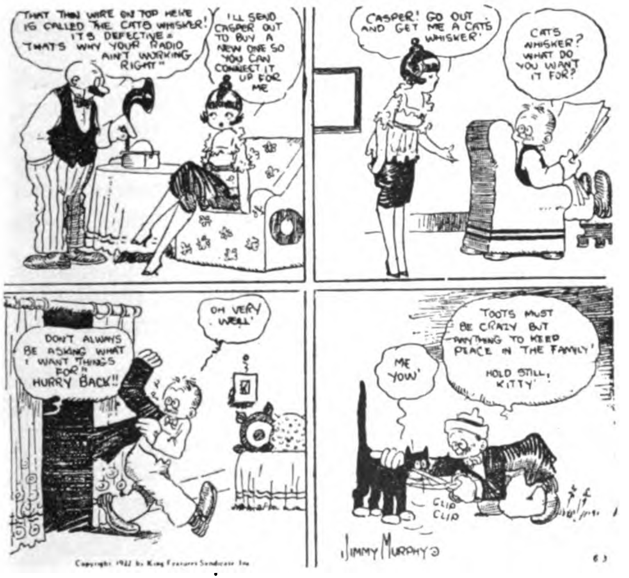
—*Fisher, in N. Y. Evening World*

OUR OWN WEEKLY RADIO RAVINGS


THE RADIO APPARATUS IS ALL SET FOR THE DAILY BED-TIME STORY, BY PHILANDER M. DROWSY, BUT THE AIR WAVES GET SCRAMBLED AND THE CHILDREN THINK THE MACHINE IS CONNECTED WITH THE ASYLUM.
ONCE UPON A TIME A LITTLE BOY ASKED HIS MOTHER WHERE THE MOON GETS ITS LIGHT - KID McSLAMM LANDS CLEAN UPPERCUT TO JAW - SLIGHTLY WARMER TOMORROW WITH LIGHT SHOWERS AND EAST-WESTERLY WINDS - CONSOLIDATED TOOTHPICK PREFERRED CLOSED AT 37½ - "WAY DOWN UPON THE SWANEE RIVER" - FRESH RIOTS IN SOUTH AFRICA - EGGS WILL BE 38¢ A DOZEN TOMORROW - SPEAKING OF THE MOON -
MAYBE YOU GOT THE WRONG KIND OF A MACHINE, DADDY. WHY DON'T YOU GET ONE THAT SPEAKS ENGLISH?
R. L. GOLDBERG

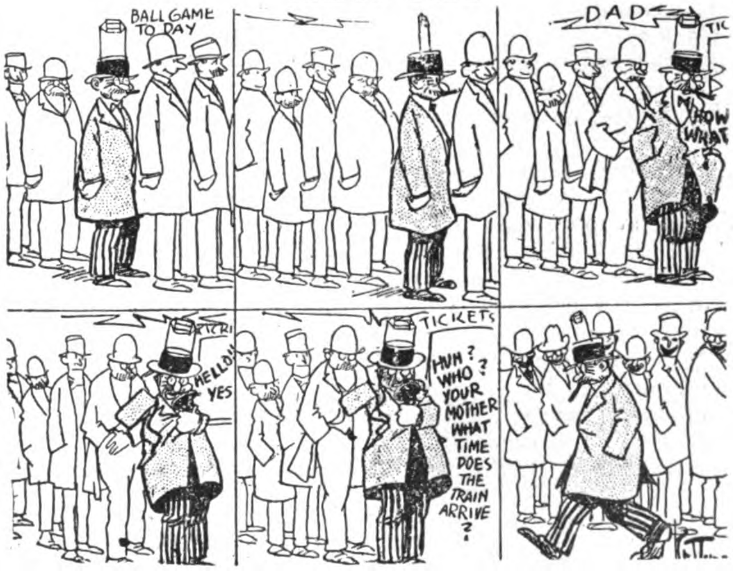
—*Los Angeles Examiner*

TOOTS AND CASPER


THAT THIN WIRE ON TOP HERE IS CALLED THE CAT'S WHISKER! IT'S DEFECTIVE - THAT'S WHY YOUR RADIO AIN'T WORKING RIGHT"
I'LL SEND CASPER OUT TO BUY A NEW ONE SO YOU CAN CONNECT IT UP FOR ME
CASPER! GO OUT AND GET ME A CATS WHISKER'
CATS WHISKER? WHAT DO YOU WANT IT FOR?
DON'T ALWAYS BE ASKING WHAT I WANT THINGS FOR" HURRY BACK!!
OH VERY WELL'
ME YOW'
TOOTS MUST BE CRAZY BUT ANYTHING TO KEEP PEACE IN THE FAMILY' HOLD STILL, KITTY'
CLIP CLIP
JIMMY MURPHY
Copyright 1922 by King Features Syndicate Inc.

—*N. Y. American*

RADIO BILL



—*Covington (Va.) Virginian*

Witching Wireless Waves Whirl Wittily

An Exceedingly Remarkable Interview

By R. E. Porter

THE fame of the Hon. T. Dingbatus Montgomery Nutmeg is a household byword on a couple of continents. He is especially liked by the housewives, being what might be called a ladies' man.

And he has strong opinions of his own.

When along came radio he was among the first to be asked to broadcast. His address was a powerful plea for the greater use of condiment. Thus it was that the Editor considered him a peppery subject for an interview.

"Get a good spicy interview with Hon. T. D. M. Nutmeg," read the assignment.

So I went to his club on Fifth Avenue, following which I scrivened as below:

The Interview

HAVING just returned from an interview with the Hon. T. D. M. Nutmeg, let me observe that he knows so little of radio that he thinks a loose coupler is an unscrupulous "marrying parson." So I am going to give you a verbatim report of our conversation, uncolored and without leaving out a comma.

"Now, Mr. Nutmeg," I began, "we are very anxious to get a good interview on what you think of radio—opinions gathered, of course, from your broadcasting experience."

He looked at me with a perfectly blank expression.

"Huh?" he asked.

I repeated my statement.

"Radio?"

."Uh-huh!"—he had me doing it, too.

"I don't know anything about it," said the noted statesman.

"But surely you have impressions. It would be difficult (even for you) to prevent getting one after broadcasting."

"No impressions," he grunted.

(Remember, I'm giving you the straight interview.)

"What do you think about sending your voice through the air? Doesn't that inspire you?"

LIFE ON THE RADIO WAVE

– UPON WHAT GROUNDS DO YOU DEMAND DIVORCE, YOUNG WOMAN?
"RADIO," YOUR HONOR! MY HUSBAND HASN'T EVEN NOTICED ME IN TH' PAST THREE WEEKS 'SNIFF' SNIFF'
HA! THAT'S A NEW ONE!

—*San Francisco Chronicle*

"Never thought about it before. But I guess it is wonderful."

"We think, Mr. Nutmeg, that radio will be a powerful force for good. What are your views along those lines?"

"Never thought about it."

I tried again: "Radio will break down boundaries between countries. It will make people more friendly. It may eliminate wars altogether. Don't you think so?"

"Huh?"

I repeated.

"Possibly . . . but I don't know a thing about this radio."

Here his expression mutely pleaded, "Hey you, quit pickin' on me."

But I persisted. "Radio undoubtedly will be a potent factor in bringing amusement into the homes. It will keep the boys off the streets. Don't you think so?"

"Um . . . it might, I never gave it much thought, though."

"And then," I continued, "think how radio can be used in sending out descriptions of football games, baseball games, and so forth. It will be a power in athletics—building up the youth of America, and all that—don't you think so?"

"I guess it will—but I don't know much about it."

Once more I tried. "Well, how about the possibilities of the radiophone for use in politics? Should political speeches, in your opinion, be permitted on the air?"

"Politics? I don't know."

"Think of the influence of a speech on the air, addressed to a hundred thousand people!"

"I'm tryin' to."

"Have you any more suggestions?" I asked, in conclusion.

The mighty statesman looked thoughtful. "Yes," he said, impressively, "you write a profound interview, and say I said it."

"A man's voice can now be heard all over the country," says President Lowell, "and soon will be audible all over the world." And even then there will be a lot of discontented people who will spend a lot of time hollering "Louder!"—*N. Y. World.*

Our Own Broadcasting Program

This program can be heard by anyone who succeeds in remaining awake. Merely connect up your sewing machine, using a borrowed umbrella as an antenna. The service is free, positively. Tune your instruments as much as you care to.

DAYLIGHT THRIFT TIME

SUNDAY

7 P. M.—Big Bill Haywood will deliver a sermon on "Feet; Why Your Left Should Synchronize With Your Right When The Police Are After You."

8 P. M.—Dr. Thomas J. Nickelsnatcher, of the firm of Jump Brothers, will deliver a lecture on "What Comes After The Purchase Price," describing in verse and prose the appearance and wherefores of bill collectors and sheriffs.

9 P. M.—Remarkable demonstration of reproduction of a spirit photograph by radio. Subject: Ex-Soldier Receiving the Bonus.

10 P. M.—The brothers Trade and Mark Smith will demonstrate new styles in coughing.

MONDAY

7 P. M.—Bedtime story by Humpty

When Whimsical Wisdom Winks

Dumpty, Never Sit On A Wall; or, Don't Be An Egg.

8 P. M.—Professor Hoof will teach the latest dance, the "Salary Slide," originated on Saturday and now a weekly favorite.

9 P. M.—Lesson in concentration. Over a period of sixty minutes Hiram Gooseberry, the famous mathematician, will count the revolutions of an electric fan.

10 P. M.—Swimming lesson on the wireless waves, by Annette Kellerman.

TUESDAY

7 P. M.—This entire evening will be devoted to an illuminating lecture by Mr. Hi Frequency, on radio elementals, including valuable technical data on "How to Insulate the Ground." Miss Lotta Gas demonstrates the ease with which persons are put to sleep by ether waves.

Squire Owens will lecture on how to yank grand opera out of an electric light socket.

(For Wednesday, Thursday, Friday and Saturday, roll your own)

"Listen!"

By Essie Phelps Duffy

Our boy has built a station
For receiving wireless,
There's an aerial, vacuum tube,
O, a hundred things I guess
That we do not know the names of;
But he sits down there at night
So deaf to anything we say,
We're out of patience, quite.
If we venture just a question
Of his school work for the day,
He will motion us to silence,
And we only hear him say—
"LISTEN!"

His sending and receiving set
Are really very neat;
He built a cabinet and desk
To hold them, all complete;
There're little knobs and things to turn,
And switches by the score;
And batteries in rows and rows
Are lined up on the floor.
He puts a "rigging" on his head
And takes his pen in hand,
And then he scarcely says a word
That we can understand,—
But—"LISTEN!"

He talks of coil, condenser,
Spark-gap, motor; helix, too;
Well it really is a marvel, what
These things combined, can do.
For they seem to form a prison
That can chain the waves of sound,
And every eve at nine o'clock,
We wait and wait around,
And when, o'er seven hundred miles
From Washington, D. C.,
The Time comes singing in through space,
We're quite convinced, and we—
LISTEN.

He gets reports on weather,
And he gets the Springfield "Press,"
And the way the news comes flying
Is astounding, I'll confess.
Why, it seems almost uncanny,
Just as if the sound was hurled
To this little wayside corner
From an unknown Spirit world;
And last night I nearly fainted,
When he jumped and hollered, "*Wow!*"
"It's an SOS I'm hearing,
There's a steam-ship calling now!"—
LISTEN!!!

He's installed an amplifier,
We can hear the people talk
By telephone to Frisco,
All the distance from New York;
And from Pittsburgh too, and Cleveland,
And 'twas but the other day
That we heard a brass band playing
Near a thousand miles away;
So, although we sometimes tire,
Why we wait and wait around,
And we dare not fix the fire,
O, we dare not make a sound—
We just LISTEN.

But it's worth it—all the trouble—
Just to see the lad succeed,
When he gets "high power" stations
We are gratified indeed;
We are learning calls, and wave-lengths,
And we know that POZ,
One, two, six, and then two ciphers,
Stands for Nauen, Germany.
Wireless—morn,—and noon,—and evening—
We absorb it—wouldn't you?
There! He says that Boston's talking,
I must go and hear him too—
"LISTEN!"

EDDIES' FRIENDS

REALLY, IT'S THE MOST WONDERFUL THING!!! JOHN MERELY TUNES IN ON THE ANTENNA OR THE BATTERY OR SOMETHING, AND WE CAN HEAR EVERYTHING JUST AS PLAIN!
I HAVE A FRIEND WHO HAS ONE, AND HE SAYS — — —
WELL, IF THAT'S THE CASE, I'LL MAKE [illegible] GET ONE FOR ME TOMORROW. YOU'LL SHOW HIM HOW TO WORK IT, WON'T YOU?
EDDIE SAYS HE NEVER HEARS ANYTHING BUT SERMONS ON HIS — HE'LL SELL IT CHEAP
I READ ABOUT A MAN WHO HEARS IT ALL THROUGH HIS BED SPRINGS

—*N. Y. American*

Wise Crack-les

Readers are urged to send in their Wise Crack-les on Radio. Let 'em come, all you humorists.

A. Conan Doyle Does Say There's A Lost World

"Nelson White is erecting a wireless station in White & Son's hall and we hope soon to be connected with the outside world by this method."

Harrison briefs in Three Forks, Mont., *Herald*.

* * *

In the same column, though hardly connected with wireless, appears this hot news item:

"Walter Pease met with a severe accident Thursday while out on the Montana Power line repairing the wires by falling about 15 feet from a telephone pole, breaking his leg and lacerating it with his climbers."

An unusual way of repairing a power line.

* * *

Osculatory Oscillation

"Kiss me by radio,"
Gosh! That is tough.
Lady, O, Lady, O,
'Tain't close enough.
—*Washington Times.*

"Kiss you by radio?"
I'll say it's tough;
Kiss you any way-io
Would be enough.

WORLD WIDE WIRELESS

Radio Jams United States Patent Office

WHILE the radio telephone has literally added to the joys of nations, it has burdened the United States Patent Office with a flood of applications for new patents. The Patent Office for years has been swamped, and has been falling further and further behind every day. With the development of the radio industry an added strain was thrust upon it, and as it had been unable to keep up to date before the "radio flood," wireless has jammed the Patent Office even more than it has jammed the air at certain spots. Already more than a thousand radio patents have been issued, and between 2,000 and 3,000 are pending. Many of these latter, however, never will be issued, for they cover ideas that are not new. The great popular interest in wireless has served to start thousands of experimenters working, many of whom rush into the Patent office with their discoveries instead of employing an experienced patent attorney to make a search and tell them whether or not their invention is patentable.

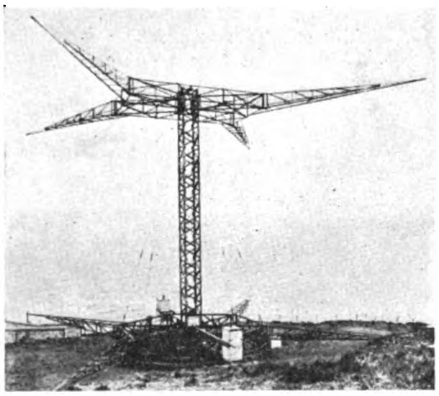
French Fishermen Use Radio

MORE than 200 French fishing schooners are to be equipped with radio transmitting equipment using from 250 to 1,000 watts. In 1918 only thirty fishing boats were so equipped, and the installations proved so valuable in reporting catches and in saving life that it is expected that soon every French fisherman of any size will use radio.

Cures Pneumonia by Radio

DR. W. S. IRWIN, surgeon of the *President Adams,* of the United States Lines, who was probably the first ship's surgeon to treat a patient by wireless, recently added another cure to his list of long-distance treatments by radio. The most recent case was that of a seaman on a freighter, dying of pneumonia. By means of radio messages between the two ships, far separated in the sea, Dr. Irwin diagnosed the case, secured a list of the remedies carried by the freighter, prescribed the treatment, and at length was rewarded by a flash from the lumbering tramp steamer that the seaman was recovering. Dr. Irwin first earned fame about ten years ago as "the man who cut off a leg by wireless," having directed the amputation on a distant ship when his own was in the Caribbean.

As more and more ships install wireless telephone transmitting apparatus, the radio telephone is adding new laurels to its humanitarian crown. The S. S. *America,* of the United States Lines, had a telephone set installed some time ago, and demonstrated on its first trip thereafter the value of the installation, the surgeon giving directions by voice to the captain of a freighter 300 miles away, who was ill with ptomaine poisoning. The man's life was saved. Since then every voyage demonstrates anew the great value of the radio telephone.



This is a "radio beacon" just erected at Inchkeith, an island in the Firth of Forth. It sends forth automatic directional compass bearings for the guidance of ships

Irish Destroy a Station

THE British Admiralty Station at Bunbeg, Donegal, Ireland, was destroyed by Irish Republicans on May 10, causing damage estimated at 20,000 pounds sterling or about $97,200 at the normal rate of exchange. The wireless equipment and buildings were burnt only after the furniture of the station and the personal effects of its personnel had been sold at auction to the neighbors.

March Radio Exports

EXPORTS of radio apparatus from the United States during March totaled $21,180, according to the figures of the Bureau of Foreign and Domestic Commerce, which always are about three months behind due to the necessity of collating reports from all ports. Japan took nearly half the March shipments, and Canada came next with $6,761 worth.

France Marvels at American Progress

SOMEWHAT enviously, France, which for years has used the radio telegraph intensively for Government purposes, has cast eyes upon American broadcasting. Here is what "Radio-électricité," a French radio paper, says in a recent issue, in an article entitled "Mister Broadcasting, Friend of Radio:"

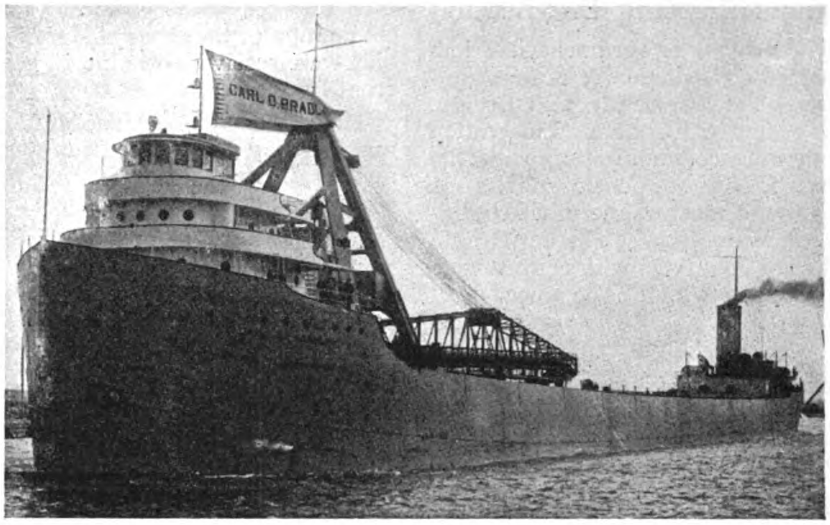
"You have guessed it, the name is American, which does not necessarily mean that the person is of that nationality. However, it is certain that Mr. Broadcasting has made a fortune in America, which, over there, gives him the freedom of the city. All the great daily papers of New York, Chicago, Philadelphia, etc., speak of broadcasting. Each week, one or two pages of these powerful organs are consecrated to broadcasting, whose magic name spreads itself over their columns in enormous letters. All American children dream of this personage who has become equal to a god over there; each American family dedicates itself to the new cult. . . . Each wishes to possess a radiophone or aeriola; the journals publish the daily programs, and Mr. Broadcasting has done so much for wireless telegraphy that you cannot find today a single one of the marvelous instruments in any dealer's shop." The article concludes by pointing out that France is far behind even Germany in broadcasting services, and demands that the Government take steps to develop "this art that keeps the family within the home, which develops the taste for science and art, which permits hundreds of thousands of listeners to hear the greatest artists, follow the lessons of the most learned professors, and hear the most eloquent of orators."

New Equipment for Mail Airplanes

AIRPLANES used in the U. S. Mail Service are being equipped with radiophone transmitting and receiving apparatus, in order to enable the pilots to keep in close touch with the flying fields, aiding them in reaching their destinations. The first of these machines so equipped was recently flown from Chicago to Washington in just two minutes over six hours, at the rate of 119 miles an hour, and the pilot reported that his new wireless telephone set was of great assistance.

Protest Closing of Naval Station

PROPOSED dismantling of the Navy wireless station on Grand Isle, La., has brought forth a flood of protests from the residents, who are either fishermen or truck gardeners. They have been profiting greatly by using the market information collected by wireless, in the case of the truckmen, while the fishermen have been able to save themselves from storms as a result of the station's weather reports of Gulf storms. Closing of the wireless station would cut the island off from quick communication with the mainland, and handicap the residents in comparison with other districts along the Gulf. The Navy states that it intends to close the station as a matter of economy, as its commercial business has not been sufficient to warrant its continued operation.



The Radio Corporation of America recently installed a 200-watt radiophone set on the S.S. CARL D. BRADLEY, a Great Lakes cargo boat, which thus had the honor of being the first vessel on the Great Lakes to be so equipped. The set is of the type described in the June issue of THE WIRELESS AGE, and proved its value the day it was put in commission

Show Apparatus at Paris Fair

THIS year for the first time wireless telegraph and telephone apparatus was shown in large numbers in the annual Paris Fair, held in May. Numerous exhibits of commercial and amateur instruments attracted large crowds of French amateurs and the general public. The two "Halls de l'Electricité were thronged with visitors. Special interest was shown in a receiving set making use of a loop antenna in hexagonal form, with the tuner and radio and audio-frequency amplifiers mounted within the base upon which the antenna is fastened.

Radio Serves Holland

WIRELESS weather reports now are transmitted daily by the Netherlands Government, which has found it so successful in code that it is planning to send out the reports by radio telephone, in order to make them available to farmers who do not know the code. Already much radiophone broadcasting is being done in Holland, the Amsterdam Stock Exchange sending out a bulletin every fifteen minutes giving current quotations, and when the exchange closes, a press bureau uses the station for domestic and foreign news bulletins. On Sundays from 2 to 5 music and speeches are sent out by the Netherlands Radio Industry at the Hague.

Dr. Michael A. Rebert, surgeon of the S.S. PRESIDENT TAFT, has several "radio cures" to his credit, having frequently treated sick persons by wireless. Here he is seen in the wireless cabin, giving instructions for the treatment of a sick man on a ship far distant over the sea

R. C. A. Opens Chicago Office

IN order to secure a more central point for distribution of its apparatus in the states of the Middle West and the Pacific Coast, the Radio Corporation of America has opened a district office of its sales department in Chicago, and also has secured warehouse space. The new sales office is at 10 South La Salle Street, and the warehouse is in Unit B of the Central Manufacturing building. With these new facilities the Radio Corporation's distributors will be better served in the states of Missouri, Kansas, Nebraska, Illinois, Indiana, Michigan, Iowa, Minnesota, Oregon, Wisconsin, Oklahoma, Texas, Louisiana, Ohio, California, Kentucky, Tennessee, Montana, Alabama, Colorado, Utah, and Washington.

Requires Use of Radio Compass

THE captains of the Standard Oil fleet of tankers have been ordered to "make full and frequent use of the Naval Radio Compass stations in determining their correct positions." In the event that a Standard Oil vessel runs aground, the company will make an investigation in order to ascertain whether or not the vessel was near any of the 44 compass stations, and whether or not the captain made use of the facilities, in order to determine his responsibility for the accident.

NPO Changes Wavelength

THE U. S. Navy station at Cavite, NPO, in the Philippines, now operates on 13,700 meters when sending East-bound messages. The new length was selected after tests with 14,200 and 13,900 meters, each of which lengths were found to interfere with the Japanese and British stations in the Pacific.

Norway Builds a Station

ADDITIONAL commercial radio telegraph facilities between Norway and the United States are to be secured by the installation of a powerful station on Rundemanden, a mountain 2,500 feet high near Bergen, Norway. The station will work with England and the Continent as well as North America.

Belgians Building Big Station

THE Belgian Government has just started construction of a new wireless station at Ruysselede, near Bruges, in the center of Flanders. The station will provide communication with the Belgian Congo, in Central Africa, as well as with most of the other continents when necessary. The aerial is to be of the radial type, with eight towers each 275 meters high. The power plant will consist of a 1,000-kilowatt generator with two high-frequency transformers of equal power, one of the arc type and the other an alternator of the Bethenod-Latour system. On a wave length of 25,000 meters it is expected to put 850 amperes in the antenna. High-speed transmission is to be used. Other stations are being erected in the Congo to work with it.

A Six Million Market

A MARKET for 6,000,000 radio receiving sets in five years is seen by the Copper and Brass Research Association, which set this modest figure after a short investigation. The Association is composed of manufacturers of copper and brass, who realize that radio apparatus consumes annually many tons of their metals. In reaching the figure of six million sets, the Association took as a basis the fact that there are approximately that number of phonographs now in use, and that the cost of the average receiving set is about equal to that of the average phonograph. Radio experts, however, point out that the six million phonographs were sold over a period of some fifteen years, while at present there are about 1,500,000 radio receiving sets in use, 85 per cent. of which were purchased within the past year. This seems to indicate that radio is destined to far surpass the phonograph, until there is one in every home.

Will Listen for Spirit Waves

SIR ARTHUR CONAN DOYLE, who recently came to America to lecture on his psychic investigations, has become a radio fan, and will take back with him to England a complete wireless outfit of American make. He states that though so far he knows nothing of radio, he feels sure that it will give him a deeper insight into the psychic world.

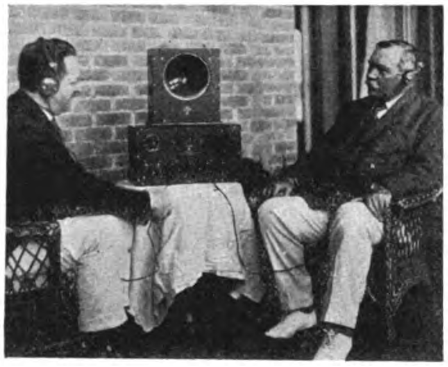
Navy Sells Surplus Tubes

THE surplus radio transmitting tubes that the U. S. Navy advertised recently for sale to the highest bidder have been sold to Bachrack Brothers of New York. The Bachrack bid was $2.51 each for the 30,000 tubes, which was not the highest bid, but it was accepted as technicalities caused elimination of the other bidders. Many bids were received, ranging all the way from 10 cents each to $4.0069.

The tubes, while designed for transmission, may also be used for detection and amplification by re-slotting the receiving tube socket 45 degrees away from the slot required by the usual detector and amplifier tube. This is rendered necessary by the fact that the Navy tubes have their retaining pins in this position. The tubes when sold by retailers must be in their original cartons, which must show their origin and the fact that they are for amateur or experimental use only.

Signals Circle the Globe

THE time signals sent out by wireless from Annapolis have been heard in the antipodes, half-way around the earth, at exactly the opposite point from Annapolis. C. E. Adams, astronomer and seismologist at Hector University, Wellington, New Zealand, reported recently that he had heard distinctly the Annapolis signals. The signals were heard only a fraction of a second after transmission, and apparently came both ways around the world.



Sir Arthur Conan Doyle, the famous British novelist and spiritualist, became a radio fan on his recent visit to the United States, and plans to use American wireless apparatus in his work

Michigan Buys Transmitters

THE state of Michigan has purchased from the U. S. Shipping Board 13 transmitting sets, for use throughout the state, particularly at the various ports and mining and agricultural centers. The sets, which were originally purchased for the Shipping Board's wooden vessels, are 1 kilowatt spark transmitters. They will be used for transmitting weather reports, crop and market reports, and official state messages, to local authorities such as forest rangers, police, shipping and coast guards. Other states have made inquiries of the Shipping Board as to its equipment with the evident purpose of acquiring some of its sets.

Navy Studies Static

THE U. S. Navy this Summer is making a special study of static in order to determine more facts as to its cause and methods of overcoming it. All the Navy Radio Compass stations are co-operating with the Weather Bureau in making observations as to the locations of static disturbances, in order to discover whether there is any connection between storm centers and static centers. Three static compass bearing observations are taken daily during the progress of the work.

Coming Radio Shows

ALL Kansas always goes to the State Fair, held every year at Hutchinson. This year Kansas and other visitors will see not only the State Fair, but also the Kansas Radio Exposition, which is to be a feature of the event, to be held September 16 to 22 inclusive. An entire building is to be given over to the radio exhibits. The State Fair is a semi-official event, being conducted under the auspices of the State Board of Agriculture.

Toronto, Canada, will have a radio conference and show on September 8 and 9. The leading Canadian figures in the radio industry will attend, as well as several experts from the United States. Important matters in relation to the use of wireless in the Dominion will be discussed, and many manufacturers and dealers will display their apparatus.

The second annual Pageant of Progress, which will be held on the $5,000,000 Municipal Pier, at Chicago, Ill., July 29 to August 14, inclusive, will have many radio features of unusual interest. A large radiophone broadcasting station will be located on the pier during the exposition and will be in charge of a committee of well-known radio men, including George E. Carlson, Commissioner of Gas and Electricity; L. R. Schmitt, Chief Radio Inspector, Ninth District; Dr. W. A. Evans, of the Chicago Tribune; John T. Tansey, Secretary of the Illinois Radio Club; Geo. B. Foster, of the Commonwealth Edison Co., and Barratt O'Hara, Chairman of the Board of Directors of the Illinois Radio Club, and Wm. J. Herrmann, manager of the Cort Theater. A large block of space has been reserved for radio manufacturers, dealers and others connected with the radio industry. It is predicted by the management that the total attendance of the exposition will be in the neighborhood of 2,000,000.

Newark, N. J., will have a radio show October 4 to 7, inclusive. It will be held in the Robert Treat Hotel, and will be under the management of Edward Siegelson, who managed the show last Spring in Newark.

Marconi Demonstrates Directional Radio

Gives Practical Demonstration of the "Wireless Lighthouse" and Information on World-Wide Investigations of Static and Long-Wave Reception at the Antipodes

SENATORE Guglielmo Marconi, who is now the guest of the Radio Corporation of America in this country, lectured on June 20, before an audience that packed the large auditorium of the United Engineering Societies Building at 29 West 39th Street, New York City. The occasion was a joint meeting of the Institute of Radio Engineers and the American Institute of Electrical Engineers.

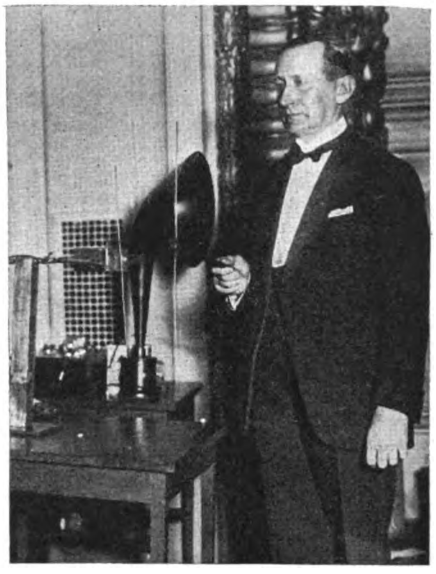
The audience of 1160, which was crowded into a hall built to hold 1000, was the largest which has ever attended either separate or previous joint meetings of these organizations. A conservative estimate is that an additional 500 persons could not be accommodated in the hall and were turned away.

In addition to its unprecedented size, the audience was extremely warm and enthusiastic and Mr. Marconi on his introduction was given a great demonstration of appreciative applause. In spite of its enthusiasm and interest, the great audience was a very quiet one and Mr. Marconi's pleasing voice could be easily understood at the far corners of the main floor and gallery.

Mr. Marconi in his lecture first dealt briefly with the early history of long-distance communication. He said that the work carried out by the engineers and experts of the Marconi Company in England with electron tubes or triode valves shows that, according to their experience, greater efficiency can be obtained at present by a number of bulbs used in parallel than by the employment of large single unit tubes.

Information was given in a general way in regard to recent practice in the design and construction of receivers with the object especially of improving selectivity, reducing interference, and concerning the possible speed of working.

The lecture also dealt briefly with results obtained at receiving observation stations situated in various far distant parts of the world, where it has been ascertained that radio signals arriving from high power stations situated at or near the antipodes of the observation stations, reach the receivers by various ways around the earth, not always following the shortest great circle route, and also that at such places the electric waves coming round by different ways do in certain cases increase this effect on the receivers whilst in others interfere with each other.

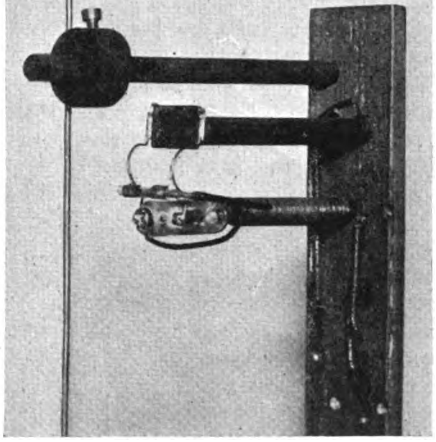


Mr. Marconi and the receiving equipment used at the directional wireless demonstration. The rod held by the famous inventor is the receiving antenna for the 1-meter waves used in the demonstration

Mr. Marconi also said that it has been noticed that apparently transmission is easier from west to east than from east to west, and that it may be necessary to modify somewhat the transmission formula for long distances.

It has also been ascertained that the most troublesome atmospheric disturbances or static usually come from the continents and not from the oceans.

The lecture further dealt with a study of short electrical waves and the results which have been obtained with waves of a length from 1 meter to 20 meters, and describes tests which show for the first time that electric waves of under 20 meters in length, used in connection with suitable reflectors, are quite capable of providing a good and reliable point-to-point, unidirectional system of radio over quite considerable distances.



1-Meter transmitter used in the demonstration of directional radio. Transmitters of several hundred watts have been successfully used in tests of directional radio by reflectors on wavelengths between 1 and 15 meters

The application of this system as a direction finder in aid of navigation, and as a method for preventing collisions at sea, was also dealt with, and Mr. Marconi spoke briefly on the great development of broadcasting in America.

Mr. Marconi's lecture in part follows:

"The results recently obtained and which go to show the relative facility with which radio signals can now be sent from England to Australia seem to indicate that there is something in the idea of the wireless waves traveling round the earth by various ways and reuniting at places near the Antipodes.

"Two expeditions, one to Brazil, and the other to New Zealand have carried out a number of most interesting and instuctive observations, and although complete reports have not yet been received, I think it will nevertheless be of interest if I give you the results of some of their important tests.

"The expedition to Brazil has just completed a series of observations at various points on the Atlantic Coast of South America, where the intensity of the signals from European and other stations has been observed and measured at all times of the day and night.

"Another expedition under the direction of the English Marconi Company, has just completed its work in measuring signals from all European and American high power stations, on a journey between England and New Zealand via the Panama Canal, and from the mass of information obtained on both day and night signals it should be possible, among other things, to reconstruct the attenuation formula. Incidentally, I may say that the signals exeed greatly in strength what should be expected according to the Austin-Cohen formula, otherwise super-long distance working would not be a practical proposition.

"Complete measurements from England to the Antipodes have been made on the Carnarvon, Nauen, Bordeaux, and Hanover signals; and also in Brazil on the American high power stations and on the U. S. Naval station, NPO at Cavite (Philippine Islands).

"The observers noted American signals form Radio Central and from Tuckerton coming from a direction which indicated that they preferred to travel a distance of three quarters of the way around the earth, rather than come by the shortest way around. Always according to the reports received from the observers on other occasions at or near the Antipodes of the English or German stations, the direction finder often indicated the signals as coming from directions all round.

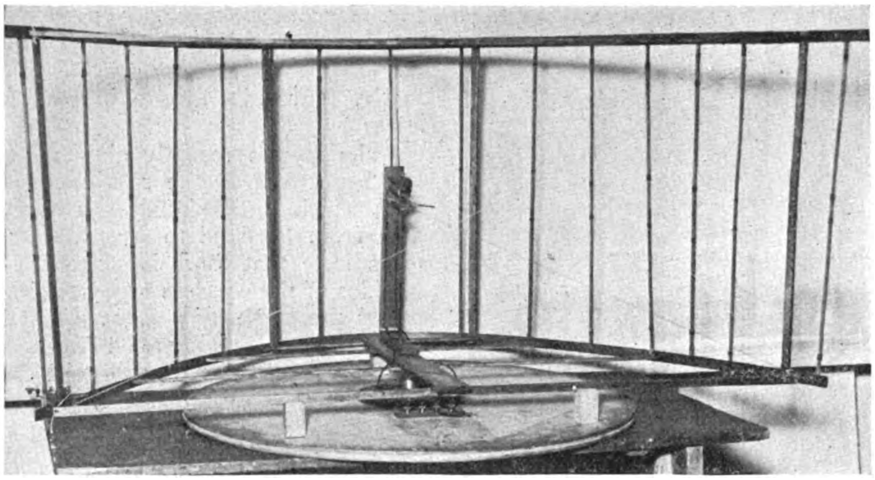
"Another interesting and rather extraordinary result was noted on several occasions, according to the report of Mr. Tremellen from Rocky Point, New Zealand, where during last March the signals from Nauen appeared to travel to him via the South Pole, whilst those from Hanover, also situated in Germany, and not very far from Nauen, appeared to prefer to travel via the North Pole."

Mr. Marconi pointed out that all his early experiments had been conducted with short wave lengths. In the development of radio communication the longer wave lengths have so much absorbed the attention of inventors and engineers that in his opinion the time has come to conduct research in short wave length radio.

"Some years ago, during the war, I could not help feeling that we had perhaps got rather into a rut by confining practically all our researches and tests to what I may term long waves, or waves of some thousands of feet in length, especially as I rememberd that during my very early experiments, as far back as 1895 and 1896, I had obtained some promising results with waves not more than a few inches long.

"The study of short waves dates from the time of the discovery of electric waves themselves, that is, from the time of the classical experiments of Hertz and his contemporaries, for Hertz used short electric waves in all his experiments, and also made use of reflectors to prove their characteristics and to show among many other things that the waves, which he had discovered, obeyed the ordinary optical laws of reflection.

"Research along these lines did not appear easy or promising; the use of reflectors of reasonable dimensions implied the use of waves of only a few meters in length, which were difficult to produce, and, up to a comparatively recent date, the power that could be utilized by them was small. This and the fact of the very high attenuation of such waves over any distance of land or sea, gave results which appeared to be very disappointing.



The semi-circular or "reflector" antenna used in the demonstration by Mr. Marconi. The signals at the receiver varied in intensity as the waves were directed at, or away from the receiver

"The investigation of the subject was again taken up by me in Italy early in 1916 with the idea of utilizing very short waves combined with reflectors for certain war purposes.

"The waves used had a length of 2 meters and 3 meters. With these waves, disturbances caused by static can be said to be almost non-existent, and the only interference experienced came from the ignition apparatus of automobiles and motor boats. These machines apparently emit electric waves from near 0 to about 40 meters in length, and the day may come when they will perhaps have to have their ignition systems screened, or carry a Government license for transmitting.

"Incidentally I might mention that one of these short wave receivers will act as an excellent device for testing, even from a distance, whether or not one's ignition is working all right. Some motorists would have a shock if they realized how often their magnetos and sparking plugs are working in a deplorably irregular manner.

"In 1919 further experiments were commenced at Carnarvon for which electron tubes or valves were used to generate these very short waves, the object being to evolve a directional radiotelephonic system. As a result of the success of these experiments it was decided to carry out further tests over land across a distance of 97 miles between Hendon (London) and Birmingham. It was proved at once that, with reflectors at both ends, good and clear speech could be exchanged at all times between the two places. The power supplied to the tubes employed is usually 700 watts. The aerial is rather longer than half a wave length and has a radiation resistance which is exceedingly high. The efficiency input to the tubes to aerial power is between 50 and 60 per cent and about 300 watts are actually radiated into space.

"With the reflectors in use at both ends speech is strong and of very good quality. It is usually strong enough to be just audible with a ¼ to ½ ohm shunt across a 60-ohm telephone. The result obtained by reflectors appeared to be so good that I was tempted to try out my old idea of 26 years ago, and test the system as a position finder for ships near dangerous points. This is now being done in Scotland. Trials are being carried out with a revolving reflector erected at Inchkeith Island in the Firth of Forth near Edinborough. The transmitter and reflector revolving, act as a kind of wireless lighthouse or beacon, and, by means of the revolving beam of electrical radiation, it is possible for ships, when within a certain distance to ascertain, in thick weather, the bearing and position of the lighthouse.

"The reflector was caused to make a complete revolution every two minutes, and a distinctive signal was sent every half point of the compass. It was ascertained on the steamer that this enabled the bearing of the transmitter to be accurately determined within ¼ point of the compass, or within 2.8 degrees. At a later date a new reflector was designed and erected and is now being tested.

"With the revolving beam the exact times of maximum signals are not easy to judge, by ear, but the times of starting and vanishing are easy to determine, as the rate of rise and fall of the signals is extremely rapid. The time half way between these two times gives, with great exactness, the moment when the beam is pointing to the ship.

"By means of a clockwork arrangement a distinctive letter is sent out every two points, and short signs mark intermediate points and half points; and this is done in practice by contact segments arranged on the base of the revolving reflector, so that a definite and distinctive signal is transmitted at every half or quarter point of the compass.

"I will now try to show you the working of a roughly constructed 1-meter wave transmitter and reflector."

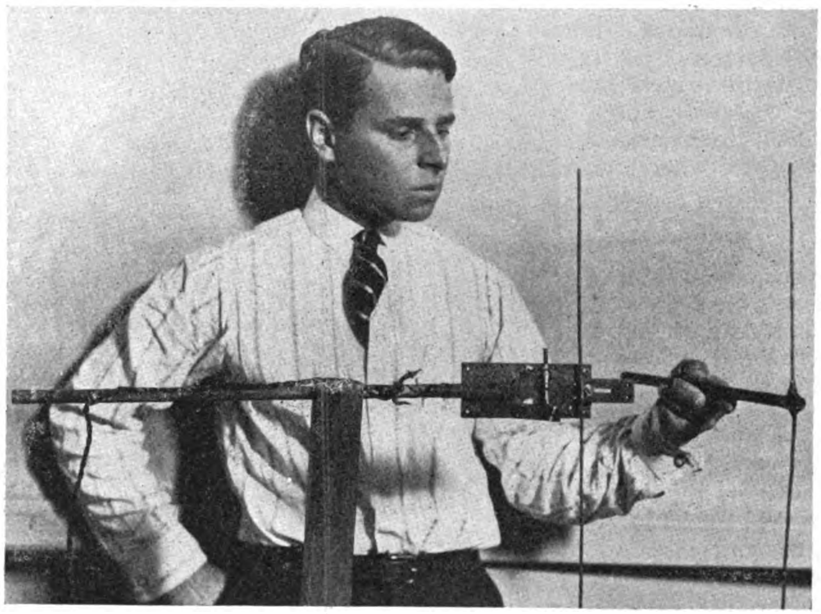
Mr. Marconi then demonstrated the directional properties of a reflector antenna by means of a model which had been erected on the platform. As the reflector was slowly revolved, the signal response obtained in the receiving set and thrown out into the hall by means of a loud speaker horn, increased and decreased in intensity as the beam of radiated energy was directed at or away from it by means of the revolving antenna reflector.

Mr. Marconi then said it seemed that it should be possible to design apparatus by means of which a ship could radiate or project a divergent beam of these rays in any desired direction, which rays, if coming across a metallic object, such as another steamer or ship, would be reflected back to a receiver screened from the local transmitter on the sending ship, and thereby immediately reveal the presence and bearing of the other ship in fog or thick weather. One further great advantage of such an arrangement would be that it would be able to give warning of the presence and bearing of ships, even should these ships be unprovided with any kind of radio.

Mr. Marconi, in referring to static, made known the following results of his investigations:

"It seems to have been definitely ascertained in a general way that the sources of bad atmospheric disturbances, or static, are situated chiefly over land, but observations in Brazil indicate that a type of static known as 'grinder' is a disturbance originating a long way off and coming from a direction which indicates the African Coast and at a time of the day when static there would be at a maximum, whereas a very violent 'click' type of static came from a direction indicating its source as being nearby in South America.

"During my present journey across the Atlantic, on board the Yacht *Elettra,* we noticed that up to about half way across (apart from the effects of local storms) static interference appeared to be coming mainly from the European and African continents, while at more than half way across they were coming from Westerly directions, that is, from the American continent. The changing over of the direction of origin of these disturbances has also been noted under similar circumstances in the Pacific."



When another "antenna" or coil of wire, the period of which was the same as that of the transmitter, was placed in front of the receiving antenna, the signals entirely disappeared, illustrating very clearly the principle of absorption

Referring to the great development of radio in this country, Mr. Marconi said it was a revelation to him, when, 300 miles off the coast he began to pick up speech and music from the various broadcasting stations of this country. In commenting on the great development of this branch of radio Mr. Marconi said:

"In thousands of homes in this country there are radiotelephonic receivers, and intelligent people, young and old, well able to use them—often able to make them—and in many instances contributing valuable information to the general body of knowledge concerning the problems great and small of radiotelegraphy and radiotelephony.

"But I think I am safe in saying that if radio has already done so much for the safety of life at sea, for commerce, and for commercial and military communications, it is also destined to bring new and, until recently, unforseen opportunities for healthy recreation and instruction into the lives of millions of human beings."

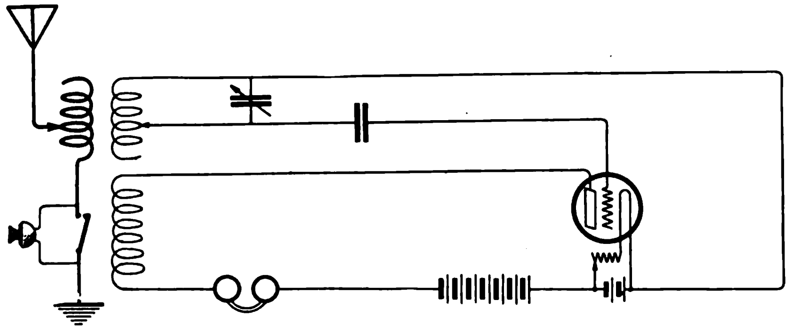
At the conclusion of his address Senatore Marconi was presented with the gold medal of honor by the Institute of Radio Engineers.

How to Convert a Regenerative Receiver Into a Simple Radiophone

By A. H. Whedon

DISCONNECT ground lead of receiver and insert a transmitter in series with the ground wire. Shunt a single pole single throw knife switch around the transmitter so as to be able to short circuit in order to receive when not transmitting. Adjust set so that detector is in oscillation as if to receive C.W. Talk or blow into transmitter and adjust tickler coil until voice is plainly heard in receiver.

This arrangement will be found to work very satisfactorily for short distances, and will afford the experimenting amateur who is not able to purchase a more expensive phone some experience in transmitting.

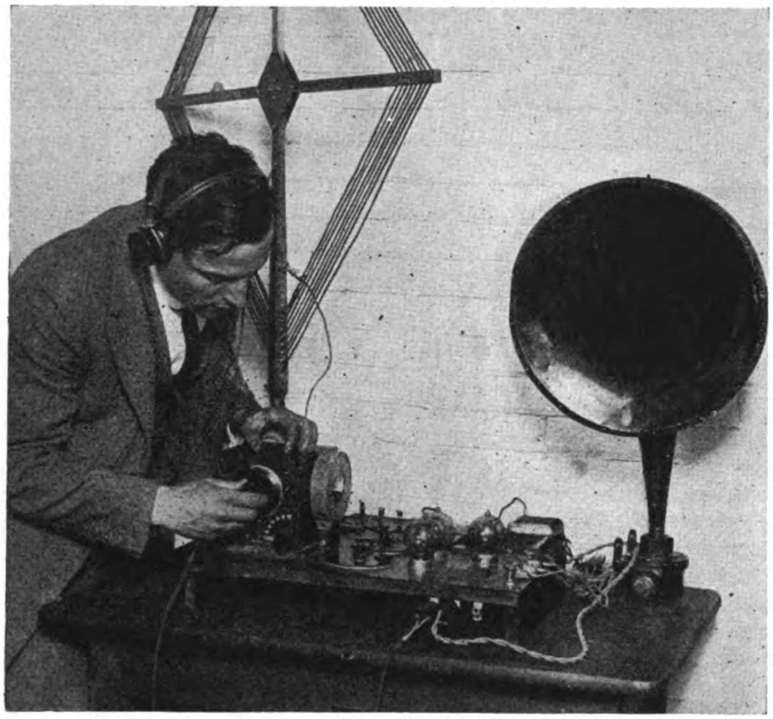


The simple radiophone hook-up

Armstrong Super-Regenerative Receiver

This New Circuit Makes Possible Amazing Amplification by Stopping Oscillations of the Regenerating Tube and Then Carrying Regeneration to the Absolute Limit

By Abraham Ringel



Demonstrating Armstrong's remarkable super-regenerative receiver before the Institute of Radio Engineers

On June 7, last, Edwin H. Armstrong demonstrated his new invention, the super-regenerative receiver, before the Institute of Radio Engineers, and described the new principle by means of which it is possible to carry amplification to what has been heretofore considered as impossible limits.

The apparatus described and demonstrated was not unduly elaborate nor were the circuits employed at all complicated. The amount of amplification obtained, however, when compared with that of an ordinary regenerative set, was amazing.

In the course of his lecture, Mr. Armstrong gave an actual demonstration of his latest discovery, contrasting a number of arrangements of regenerative and super-regenerative circuits on the concert transmitted from WJZ, at Newark, twelve miles away. The Engineering Societies Building, at 39th Street and Fifth Avenue, New York, where the demonstration was made, is built entirely of steel and stone; the steel framework being well grounded. The hall itself is on the fifth floor, and its dimensions are, about 75 feet wide, by 150 feet long.

With a two foot loop as an antenna, and a loud-speaker horn, the speech and music obtained with a two-tube super-regenerative set was so great as to flood the entire lecture hall. The quality also was surprisingly good. With an ordinary regenerative receiver, followed by two stages of audio-frequency amplification, the same loop and loud-speaker, the concert was just barely audible to listeners seated only ten feet away.

This is even more remarkable, when it is considered that in the super-regenerative arrangement, only two tubes were used, neither of which was employed for audio-frequency amplification; whereas in the ordinary regenerative circuit, three tubes were necessary, including two stages of audio-frequency amplification.

Mr. Armstrong estimates that the amount of amplification of the super-regenerative system is approximately 100,000 times as great as is possible with the regular regenerative circuit; and in some cases, this ratio could be increased to 1,000,000 to 1.

The new system is unique in one respect, in that it does not amplify damped wave signals to anywhere near the same extent as continuous or modulated continuous waves. This makes it especially desirable, therefore, in broadcast reception or in C. W. telegraphy. This discrimination against spark signals is of great value also in such congested radio districts as New York City, where spark stations often seriously interfere with a radio concert.

THEORY OF REGENERATION

Before describing the principle involved in this new extension of regeneration, we will consider the behavior of an ordinary regenerative receiver. Incoming signals are applied between the grid and filament of the tube. These oscillations are amplified in the tube and as a result, we get very much greater variations in the plate circuit. If the plate circuit is coupled back to the grid circuit, the reinforced oscillations are fed back to the grid and are once more re-amplified by the tube. In this way we can build up a very weak signal until it is of sufficient amplitude to give a loud sound on detection.

This process is called regeneration. The amount of amplification is controlled by the coupling between the grid and plate circuits. In the case where a tickler coil is used in the plate circuit, the extent of regeneration depends on the magnetic coupling between the tickler coil and the grid coil. Where a variometer is employed in the plate circuit, the coupling is capacitive, due to the capacity between the grid and plate of the tube itself, and the magnitude of this coupling is determined by the value of the variometer inductance.

The effect of regeneration is to reduce the effective radio-frequency resistance of the receiving circuit to a very low value. This the operator can prove to his own satisfaction by actually inserting several hundred ohms in the tuned grid circuit. He will find that by increasing the regenerative coupling between grid and plate circuits, he will obtain the same signal as if the resistance were not present. In other words, in regeneration we have a powerful method of annulling the resistance of a receiving circuit. In this way it can be reduced to as low as a few hundredths of an ohm. This low resistance accounts for the sharpness of tuning obtained on a regenerative receiver—very often a variation of only half a degree on a tuning knob is enough to lose a signal which is otherwise of several hundred times audibility. This helps to explain the presence of vernier adjustments on all good types of such receivers.

As the coupling is increased still further, the resistance of the circuit is lowered and lowered, with consequently greater amplification. When the resistance approaches zero, the tube commences oscillating at a frequency determined by the tuned circuits. These oscillations are identical to those obtained in continuous wave transmitters, except that they are much feebler. Although the signal received is very much louder, its quality is entirely lost. If it is a spark note, it becomes hoarse and mushy, losing its characteristic note—and speech and music, although their presence is apparent, become absolutely unintelligible gibberish. If no signals are coming in, the presence of oscillations can be detected as follows:

1. As the regenerative coupling is increased to the oscillating point, a sudden rushing or hissing, is heard in the phones.
2. Touching the grid terminal of the tube with the finger will produce a dull thump in the phones—and removal of the finger will cause a similar thumping noise.

Theory Underlying Super-Regeneration

As explained before, much greater signal strength is obtained when regeneration is increased—but this is all upset when the tube breaks into oscillation. In his super-regenerative circuit, Armstrong increases the coupling so that the tube is far beyond the oscillation point, and the effective resistance of the circuit is made even less than zero;—the circuit is made to have a negative resistance. And he stops the oscillations so that he can take advantage of this negative resistance and thus obtain overwhelmingly powerful signals!

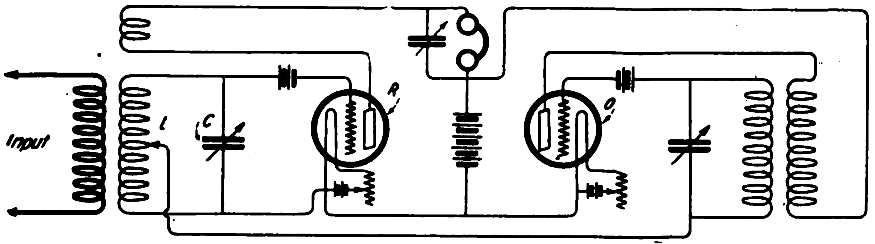


Figure 2—Manner in which the variation is introduced into the positive resistance of the tuned circuit. This is done by means of an oscillating tube O, the grid circuit of which is connected through the tuned circuit LC of the amplifying tube R

Before going any further, let us diverge a bit and delve into the theory of various tuned circuits containing (1) positive resistance, (2) zero resistance, and (3) negative resistance. In the first case, when continuous oscillations are impressed, after a short building up time, the oscillations attain and preserve a definite constant amplitude. When the impressed oscillations are removed they die away to zero. The greater this resistance, the longer it takes to build up the oscillations and the faster they die off—and vice versa. In the second case, when continuous oscillations are impressed, they keep on steadily increasing in value, depending on how long they are applied. If the source of oscillations is removed, the circuit keeps on oscillating at the same amplitude it had when the voltage was removed.

In a negative resistance circuit, if oscillations are applied, they keep right on building up to an extremely great value, regardless as to whether the voltage is removed or not. However, at any given time after the emf. is impressed, this amplitude, although very large, is always proportional to the initial applied amplitude. Thus, if we have continuous waves modulated by speech or music applied, the amplitude will be proportional to the actual amplitude of the speech waves at the moment of application. No matter how small this initial voltage is, it will at once commence to build up to an infinitely large value. So much for pure theory. In actual practice, if we go to negative resistance circuits, we cannot secure the above results, because the circuit breaks into oscillation at the slightest shock, thus paralyzing the tube.

Theory of the Super-Regenerative Circuit

Armstrong now comes to the rescue with his epoch-making discovery. He takes advantage of regeneration to the limit of a tube, and still prevents it from oscillating. He has discovered that he can stop oscillations in a negative resistance circuit either by introducing resistance in the circuit at definite intervals or by reducing the amount of regeneration, so that the circuit resistance becomes positive and negative alternately. In both cases the effect is to give the circuit first a positive and then a negative resistance. This alternation is sufficient to prevent oscillations. During the negative resistance period we can make full use of the very great amplification produced—but just as the circuit is about to start oscillating of its own accord, we introduce a positive resistance. During the positive resistance period, the circuit, of course, cannot oscillate and the resulting amplification of the incoming signals is much less than before.

This variation between positive and negative resistance may be made at any frequency desired, provided that it is less than that of the incoming oscillations. No doubt it could be done mechanically by connecting a resistance in the tuned grid circuit, regenerating beyond the oscillation point, with the resistance short circuited, and then alternately short and open circuiting the resistance at any desired frequency. Variation in regeneration may be accomplished in a similar manner by mechanically varying the plate voltage of the regenerating tube, so that the grid circuit resistance is alternately positive and negative. Then again, we may use a combination of both methods.

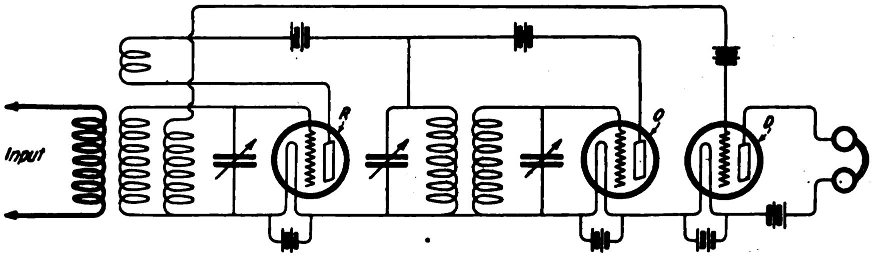


Figure 1—Method of varying the plate voltage coupled into the plate circuit. In this arrangement a third tube acts as a detector

But moving mechanical parts may be dispensed with and vacuum tube oscillators employed to produce this variation in circuit resistance or amount of regeneration. These methods are illustrated in the diagrams.

Super-Regeneration by Plate Voltage Variation

Figure 1 shows how the amount of regeneration is varied by varying the plate voltage. The first tube is the regenerator, which introduces negative resistance in the grid circuit. Incoming signals are coupled to the grid circuit, amplified in the first tube and fed back to the grid by means of the tickler coil. The tickler coupling is made large enough to carry the circuit beyond the oscillating point. The second tube acts as oscillator of any frequency desired. Generally, one of about 10,000 cycles is suitable. The amateur and experimenter will recognize the usual oscillating circuits. The coils and condensers should be so selected as to give this frequency (which corresponds to a wave length of about 30,000 meters).

Note that the plate oscillatory circuit is also in the plate circuit of the first tube. The plate voltage of this regenerating tube is thus varied at a frequency of 10,000 cycles. When the oscillations are such as to make the plate more positive, regeneration is increased beyond the oscillating point, and the signal amplitude increases to a very great value. Just as the tube is ready to burst into oscillations of the circuit frequency, the applied frequency reduces the plate voltage to a low value, and thus reduces regeneration and introduces a positive resistance in the grid circuit—effectually cutting off any sign of free oscillation. A very high degree of amplification is thus obtained during those half cycles of the 10,000 cycle oscillations when the plate is made more positive.

The grid circuit of the first tube is coupled to an aperiodic coil in the grid circuit of the last tube, which acts as a detector. Rectification is accomplished by applying a negative potential to the grid, instead of the usual condenser and leak. But it is really immaterial which method is used. The first tube may be an amplifying tube, such as a UV201. But it is desirable to have power tubes, UV202, for the oscillator and detector, because of the energy they are required to handle. Nevertheless, UV201's may be used throughout. For the receiving circuits, the coils and condensers should be of values suitable for tuning to the wave length range desired. In the oscillatory circuit, the coils should be quite large—with an inductance of the order of 100 or 200 millihenries. (Honeycomb or Duo Lateral Coils No. 1250 or 1500, approximately.) Pie-shaped coils used in spark transformers, having 1,500 to 2,000 turns, are suitable here. The condensers are ordinary 43 plate variable air condensers.

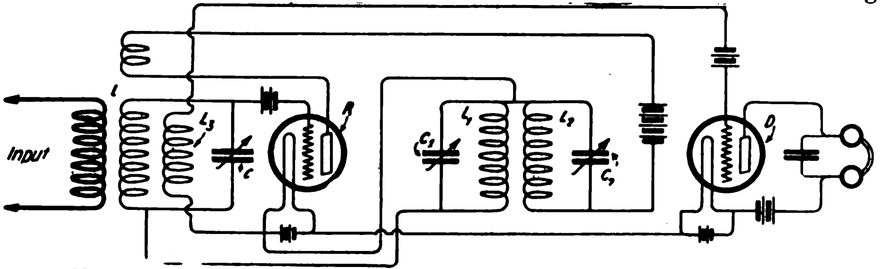


Figure 3—Manner in which simultaneous variation in both positive and negative resistances is obtained. This is accomplished by providing the amplifying tube R with a second feed back circuit L1C1 and L2C2, adjusted to oscillate at some lower frequency

The system shown in figure 1, should present no great difficulty in operating or adjusting. The condensers and coupling in the oscillator are adjusted until a very high pitched whistle is obtained. Then the receiving and regenerative circuits are tuned to the station to be received in the usual manner. In fact, the operation should be much easier than that of the average receiver.

Super-Regeneration By Resistance Variation

Figure 2, shows a method whereby a positive resistance is introduced into the tuned grid circuit of the regenerating tube. Incoming signals are applied to the grid of the first tube and amplified by regeneration due to the tickler coupling. The second tube acts as a 10,000 cycle oscillator—and these oscillations are also impressed on the grid of the first tube. The regeneration is carried beyond the normal oscillation point of this tube. During that half cycle, when the local oscillations make the first grid negative, no grid current is drawn and the effective radio frequency resistance of the circuit is negative because of the super-regeneration. The incoming signal is built up to a very great amplitude during this interval. Just as the first tube is ready to go into oscillation, the local oscillations are reversed and tend to give the first grid a positive potential. In this case, a stream of electrons commences to flow from the filament to the grid and this is equivalent to connecting a resistance of several thousand ohms across the tuned circuit. The effective resistance of this circuit is thus increased until it is no longer negative, but positive, and thus chokes off free or self oscillation in the receiving circuits. Of course, we obtain very high amplification in the negative resistance periods. In the circuit shown, the first tube acts as the detector. Evidently, Armstrong prefers to use a grid bias battery instead of condenser and grid leak to obtain rectification.

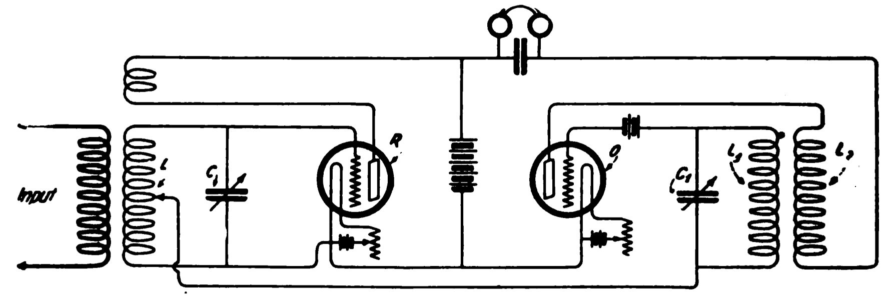


Figure 4—Shows how the oscillating tube is made to perform the additional function of a detector

Only two tubes are used in this arrangement, the first performing two functions; regenerator and detector; the other acting only as an oscillator. Since the only thing that controls the amount of amplification is the limit of the tube, better results could be obtained by using power tubes instead of ordinary receiving tubes in cases where extraordinarily great intensity is required.

Super-Regeneration by Combined Resistance and Plate Voltage Variation

Figure 3, shows a method of varying the resistance in the tuned grid circuit and plate voltage simultaneously.

The circuit L C is tuned to the incoming signals and these are impressed on the grid of the first tube—the signal being amplified by regeneration in the manner described above. In series with L and C, we have another tuned circuit L_1 C_1 coupled to L_2 C_2, which is in series with the tickler coil. These circuits are used to produce the necessary 10,000 cycle oscillations. The condensers C_1 and C_2, should be of fairly large capacity, say .001 microfarad, in order to provide a by-pass for the incoming high frequency signals—since the latter would be blocked by the high inductance coils L_1 and L_2, (of about 200 millihenries each).

The received signals are super-regenerated as usual during that interval when the 10,000 cycle oscillation applies a negative potential to the grid, and at the same time tends to increase the effective plate voltage. The oscillations in the grid and plate circuits must be of the proper phase, so as to produce both the above effects at the same time. During this half cycle, the effective resistance of circuit L C is made negative, resulting in considerable regenerative amplification. Just as L C is on the verge of self oscillation, the polarity of the applied 10,000 cycles reverses, so that the grid is made positive and the plate voltage is lowered. The former causes grid current to flow, thus introducing positive resistance. The reduction in plate voltage decreases the amount of regeneration and thus aids in increasing the positive resistance. Under such circumstances, of course, free oscillations are completely choked off.

In this arrangement, both regeneration and 10,000 cycle oscillation are performed within a single tube. A second tube, the grid of which is coupled to L, acts as the detector. The adjustments both for tuning and local oscillation are very critical. Hence this hook-up is not suitable for use by the average experimenter because of the great pains necessary in order to secure super-regeneration.

Practical Super-Regenerative Circuit

Figure 4, shows a practical two tube hook up. It is essentially the same as that of figure 2. The first tube is the regenerator and the second, the local oscillator. Free oscillations in the receiver circuit are stopped by those half cycles of the local oscillations which make the first grid positive.

The unusual feature in this arrangement lies in the use of the oscillator tube as the detector of the signals which are amplified by super-regeneration by the first tube. The amplified signals are impressed upon the grid of the oscillator tube, which rectifies them, in the plate circuit, thus making them audible.

Both tubes may be Radiotrons, UV201. But better results could be obtained with a UV202, a five-watt power tube, in the detector stage. In the latter case, much greater energy is available for loud-speaker operation. In this connection, it is important to note the plate voltage required. Where UV201's are used, the B battery should be about 80 or 100 volts. In this case, a bias of about 5 to 8 volts negative on the grid of the detector tube, would be required for rectification. With UV202's, voltages above 150 volts are desirable for the plate, and about 15 to 20 volts negative on the grid for detection.

CONCLUSIONS

Although the super-regenerative circuit may be used in conjunction with an ordinary regenerative receiver and antenna, its greatest value in the future is in its application to loop reception. Since practically the same strength of signal is attained, whether using outdoor aerial or indoor loop, the latter is to be preferred, because of its convenience. There is little doubt, therefore, that within a comparatively short time after the general application of this discovery to broadcast reception, most receiving antennas will cease to grace the house tops of the countryside.

Super-regeneration offers a powerful means of amplifying signals at short wave lengths. It is effective as low as 20 meters. In other words, it is the door to the band of wave lengths below 200 meters, which have, until now, been so studiously avoided. It is well known that many more transmitting stations can be accommodated at such high frequencies. Congestion in the ether in the neighborhood of 200 meters will be considerably relieved, when amateur stations will utilize wave lengths down to 150 meters.

A brand new field of investigation is open to the amateur experimenter. May we not now expect some new discoveries in the theory of transmission of ultra-short wave lengths? American amateurs have but recently startled the radio world when they succeeded in spanning the Atlantic Ocean with but a few puny watts, at 200 meters. With infinitely better antenna radiation from 100 meter transmitters, and Armstrong Super-Regenerative Receivers, it begins to look as if big developments in amateur radio communication were close at hand.

An Operator's Wife in the Wilderness

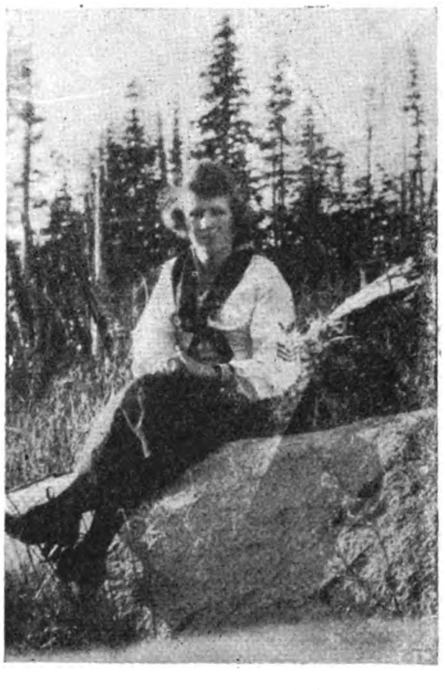
A Glimpse of Life at an Alaskan Mining Camp Radio Station Far From Civilization

By Mrs. Howard S. Pyle

A TYPICAL Alaskan rainfall greeted me upon my arrival at Jualin. Here I was to make a home for my husband, who had preceded me to his new post as radio operator-storekeeper for an Alaskan gold mining company. All of Jualin was visible at a single glance; the wharf; ugly red buildings at the farther end; and the seemingly endless forest.

I turned toward the wireless operator from the vessel, who, having previously been employed here himself, was acting as my guide. "I guess there is no one here to meet you," he was saying, "but it's only seven miles to the upper camp, and you can't get lost if you follow the mule team track." He looked dubiously at my neatly tailored suit, new hat and oxfords, however, observing that I would probably be soaked long before I reached there. But my oldest things were in my trunk and the clothes in my hand bag were even more unsuitable. The problem was still unsolved when we reached the warehouse, where over the private telephone system I called up the upper camp, only to be informed that the operator had left the camp; should, in fact, even now be at the dock. And he was. Turning about, there at my elbow was my husband!

Somehow I knew this was my life partner; but certainly not by recognition. How changed he was from the smart young man who had left me in Seattle two weeks before! A beard of several days' growth; trousers two sizes too large; high hiking boots and a rough shirt covered by a sleeveless sweater, topped with the queerest cap I had ever seen!



The authoress in Alaska

Then and there I burst out crying. The ship was fading into the distance, and I thought of friends I would probably never see again, of a once immaculate husband, of home amid comfortable surroundings . . . and then of this wilderness to which I had come. Dejectedly, I stood around, sinking lower in spirit as we waited while the freight was checked, and the mule cart loaded for the "upper camp."

Finally we started, and a funny sight we must have been: I with my city clothes, riding atop a load of sacks on a cart drawn by mules, and holding an umbrella over my head to save my new bonnet, and my husband in his old clothes perched on a load of freight with Big Bill, the teamster, bellowing at the mules. I chatted incessantly, till we reached the lower camp, five miles from the wharf, where we stopped for "chow." And such a feed! A plate heaped with fancy shaped sandwiches; egg, cold beef, and cheese, which Herman, the cook, had prepared for us; steaming hot tea, chocolate cake, delicious cream pie; all delicacies which I had never hoped to see after leaving the States. That meal marked a milestone; my despondency over Alaskan wilds vanished—never, incidentally, to return.

And thus it was that I came to my new home. The upper camp proved to be quite a settlement. There was a store, of which my husband had charge; the mine offices, stamp mill, superintendent's house, large modern bunkhouse with showers, and a pool room, also a cook house, besides quarters for several families, and of course, the wireless station KJA, with which communication was maintained with the outside world.

Our new home was located at the bottom of the valley, with 3,000-foot mountains towering on three sides, covered the year round with snow almost down to our level. Below the snow line were vegetation and dense forests which were almost impenetrable. Our cabin was of two rooms: a "galley" which contained a wooden sink, table, stove, cupboard and large wardrobe for clothing, and a large front room, which served as a living room, bedroom and operating room.

The radio installation occupied almost one entire corner of this last room, and was certainly an old-timer. It was of the Marconi 5 K.W. open core type, with a sixty-cycle straight spark gap with air blast, the discharge of which could be heard for great distances up and down the valley. The key was of the type in which heavy brass contacts were immersed in a tank of water beneath the table, and the make and break occurred under water. The lever was nearly a foot long, and took two hands to work it—almost. Often the contacts would stick so that the lever would have to be lifted up by hand to assist the spring. Two large racks holding twenty-four two-quart Leyden jars each, which formed the capacity, occupied considerable floor space. The 5 K.W. "coffin" also had its place on the floor, next to the stove. The helix type of oscillation transformer rested majestically atop the condenser racks, and several spiral loading inductances on the wall—to reach the 1980-meter wave length, completed the transmitter. The receiver was a Marconi type 101 panel, known as the "piano tuner," which was quite serviceable, after we had added a vacuum tube to replace the carborundum crystal furnished with the set. A Marconi type S transfer switch, and a two-wire antenna, eighty-five feet high and 800 feet long, completed the installation at KJA.

On our very first day we set to work in earnest, painting, calcimining, cleaning, and making our new home livable. And this activity held us for many days as the place had been occupied by an unmarried youth for several weeks, and had had scant attention. Then we settled down to our routine. The wireless apparatus required constant "nursing" and kept my husband busy, in order not to miss a schedule with the Juneau Navy Station. We maintained two such schedules a day, and they had to be on time. This, together with his duties as storekeeper, kept the operator busy from 7 a. m. till 9 p. m., and included frequent seven-mile trips to the wharf in connection with the stores.

Social life at Jualin consisted of an afternoon at the Superintendent's house, with the other four women who made up the entire female population of the place. Sewing was the principal occupation and camp gossip a side line.

The trips to the wharf and lower camp became an event of some importance in the Fall, as supplies for the Winter months arrived. In Winter Jualin has snow, and plenty of it, and we practically hibernated during the cold spell. By this time the many wild berries were ripe, and salmon were coming up the small streams to spawn, both of which attracted the black and brown bears from the hills. At first their presence was merely rumored about the camp, but after several encounters by various members of the colony, the animals were seen to be a serious menace, and the women were forbidden to leave the camp limits without suitable protection. Often the bears would come almost up to the cook house, seeking scraps of food. Porcupine, too, were plentiful, but not dangerous if unmolested.

A small mail boat arrived once a week from Juneau, bringing mail and fresh supplies, but this was only during the Summer months; trips were made in the Winter when the weather warranted. Passengers in limited numbers were also handled on the mail boat, and generally two or three would come and go each week; restless characters who had been at Jualin long enough to make a stake sufficient to carry them to the next camp.

On one occasion the passengers from the steamer *City of Seattle*, mostly excursionists from Eastern States, swarmed ashore, and loaded me with fruit, candy, magazines, books and flowers. They plied me with questions faster than they could be answered. The appearance of a woman in such a place as Jualin was beyond their comprehension.

Weeks of this life followed, when rumors began to take more definite shape about camp to the effect that the mine would shortly close. The rate of exchange on foreign capital was too high for profitable operation of foreign-owned mines, and as we were financed by Belgian interests, our mine was seriously affected. Rather than be caught in the shut-down, we talked the situation over, and laid new plans. Both desiring to remain in Alaska, our final decision was to go back to the Navy, for we had promise of being stationed at one of the Navy Radio Stations in Southeastern Alaska; Sitka, Juneau or Ketchikan, all very desirable. The mines had charmed us, and we were really loath to leave, but had to look out for our own interests.

In order to take advantage of the Navy's offer of one of the three southeastern Alaskan stations, we were required to report in Juneau aboard the *U. S. S. Vicksburg* before midnight, August thirtieth, and as the last weekly mail boat had left, and no more would call before September 3, we wired the Navy Department and a sub-chaser was dispatched to Jualin to pick us up, together with our effects, and take us to Juneau.

The mill at Jualin, with radio shack in upper left corner

Head of the valley at Jualin. Station located in bowl at foot of mountains

That evening we walked off into the woods, to a favorite spot we had, near an old abandoned mine shaft, to talk over our future plans. In the distance, Old Lions' Head, said to be an extinct volcano, reared its snow-covered head, and made us feel more than ever reluctant to leave. There were also mines on the other side of Lions' Head, but only once had we seen anyone from over there, when an old prospector walked into camp one day, with his dog, gun and portable canoe.

The next morning we started for the wharf for the last time. Our boxes and trunks were to follow us to Juneau on the weekly mail boat. We reached the wharf, just as the sub-chaser came up the bay, and it was indeed a welcome sight, for we had missed our Navy associations. But were we free from the Navy and Jualin again running full blast, I know two persons who wouldn't hesitate at returning to KJA.

Ninety-Mile Voice Communication by Radiophone on Moving Train

IN a series of radiophone transmitting and receiving tests on the lines of the Frisco System, between a moving train and two stations at fixed points, speech and music were successfully transmitted and received over a distance of nearly 100 miles, undoubtedly establishing a record for this branch of radio.

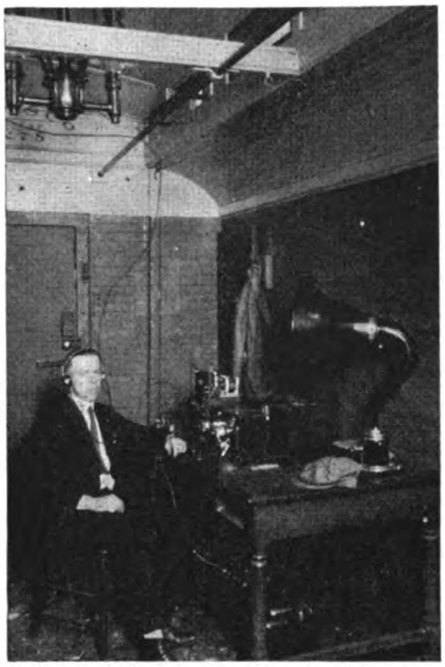
The tests were made on May 30 between a temporary station on a Frisco train, Station WKY of the *Daily Oklahoman*, and the Government radio station at Post Field.

Equipped with a regenerative receiving set, with four stages of amplification, a loud speaker, a 100-watt tube transmitter and a novel antenna, consisting of four, four-wire cage antennas, strung from one end of the car to the other, the special car was attached to Frisco train No. 9 at Oklahoma City on the morning of May 30 and hauled to Lawton, Okla., a distance of 100 miles.

At Mustang, Okla., a distance of thirty miles from Oklahoma City, where the station of the *Daily Oklahoman* is located, a severe electrical storm was encountered, but signals were received and little static encountered, the signals and music being of sufficient strength to be heard above the static. In fact, constant communication was kept up between (WKY) Oklahoma City and DM6 (Post Field) and the car.

At Cement, Okla., sixty miles from Oklahoma City and forty miles from Post Field, the signals, music, weather reports and Liberty bond, and other quotations were received with as much clearness as they were at Wheatland, Okla., only sixteen miles from Oklahoma City.

On May 31 the same trip was made with the car over the same stretch of track and proved to be even more successful than the one made on May 30. Favorable weather conditions, together with improvements in the apparatus, contributed to the success of the trip on May 31. The speech and music in these tests were transmitted for more than ninety miles and the signals were received on the Frisco train with only two stages of amplification in such volume as to make them audible above all other noises or disturbances. The return trip from Lawton was made on June 1 and the same success was had as on the two preceding trips.

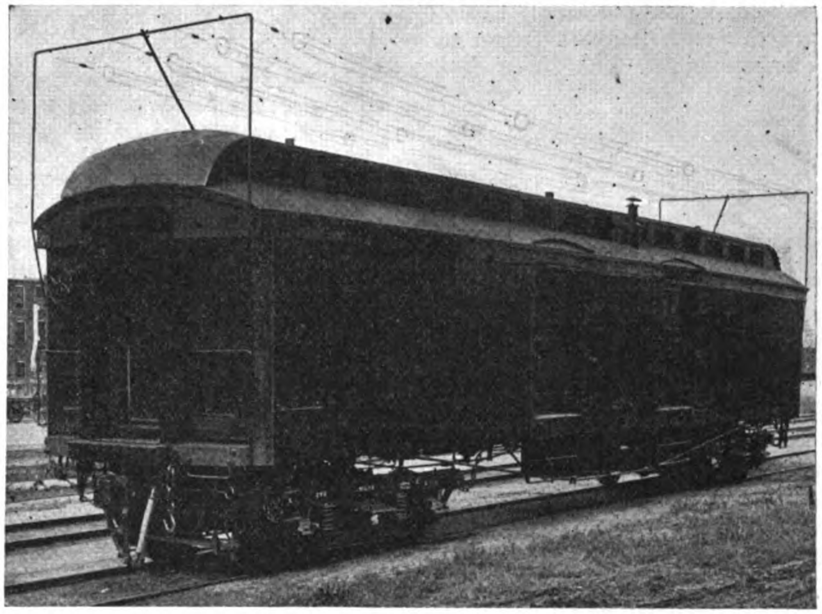


Interior of the car showing set. Operator H. S. Richards at the table

J. C. Brennan, superintendent of telegraph for the Frisco lines, Carl Williamson, assistant superintendent of telegraph for the some lines, Robert M. Reed, radio editor of the *Daily Oklahoman* and Earl Hull and Sherwood Richards of the Oklahoma Radio Shop completed the testing party. On all trips made, the special car was full of passengers who had been invited to listen to the music and speech.

The Frisco officials are taking up radio in earnest and this test is the first of a series which they expect to make over the system. It is planned by the Frisco officials to first install radio receivers in dining cars and club cars as a form of entertainment for passengers, and later, if it proves practical, it will be used on various divisions for dispatching trains.

The tests made by the *Oklahoman* were a revelation to the railroad men, who entered the affair with every sort of doubt as to the success of the event and only after the twenty-five mile range had been passed were they convinced that radio could be used for practical railroad work.



Car showing antenna designed by Earl Hull, operator at WKY

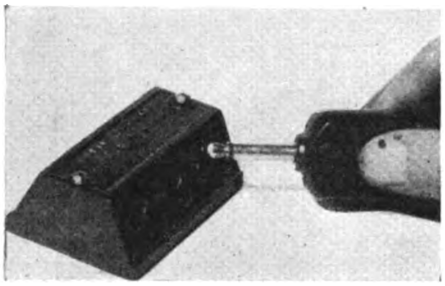
How the Britton-Leonard Championship Boxing Match on June 26, was described blow-by-blow, by voice amid the cheering of the crowd in the arena, directly from the ringside to 200,000 persons will be fully described in the August issue of The Wireless Age.

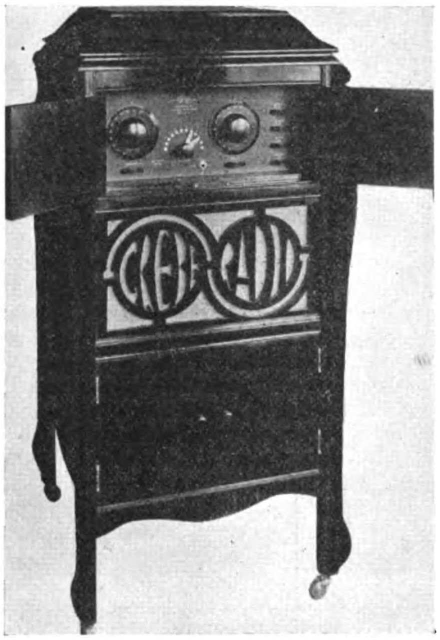
NEW APPLIANCES AND DEVICES

The Pacent Plugs and Adapter

THOSE who use radio receiving outfits know how troublesome and unsatisfactory it is to pass a single pair of phones about so that more than one person can listen in. If two sets of phones are available with only one jack on the receiver, the phones can be placed in the circuit only after trouble and inconvenience. To fill this need the Pacent twin adapter has been brought forth by Louis G. Pacent, and with it one jack can be made to serve the purpose of two. Thus the receiver can be tuned with the phones and the loud speaker can then be plugged in. The twin adapter will also be found very serviceable when making rapid connections and changes in C. W. work. The Pacent twin adapter is provided with heavy phosphor bronze spring connections and it is finished in polished brass and a velvety black composition. The adapter may be used with plugs of any make.

The Pacent multijack is really three jacks built into one. This new development followed closely on the heels of the twin adapter and it may be used in connection with the twin adapter and the Pacent plug. The three jacks which make up the multijack are built into composition base that may be attached to the side of a receiving cabinet, or to a testing board, or table. The ends of the multijack are flat, so that a number of them can be placed end to end where a large number of connections are necessary. If three Pacent twin adapters are used in connection with a single multijack, as many as six connections can be made. Both the Pacent twin adapter and the Pacent universal plug fit into the multijack. Like the twin adapter, the multijack is provided with heavy spring contactors, which insure low resistance connections.


The Pacent Multijack


The Grebe Radiotone cabinet

Grebe CR-10 in Radiotone Cabinet

THE latest product of A. H. Grebe & Co., Richmond Hill, N. Y., takes the form of an attractively-cased receiving set for use in homes desiring to profit from the broadcast programs. The set, which has three stages of amplification, is contained in a handsome cabinet of the talking machine type. The control panel is located just back of the two swinging doors of the cabinet, and immediately under this is the large end of the loud speaker horn, bearing across its face in pierced wood a reproduction of the well-known "Grebe Radio" trade-mark. At the bottom of tne box is space for the storage battery, rectifier, battery tester and other articles.

The number of the new set in the Grebe line is CR-10. Its range is from 150 to 3,000 meters. Tuning is done by a primary inductance having ten taps, a variometer and an 11-plate variable condenser. Both the condenser and the tickler are provided with verniers for fine adjustment.

New Elementary Book by the Radio Corporation

THE Radio Corporation of America has just published a book entitled "Radio Enters the Home," which has been written especially for the man in the street who, while knowing nothing of the technicalities of wireless, wishes to benefit by the broadcasting now being conducted in all parts of the country. Written by experts in popular language, the book, which has just appeared, has shown itself to have a great appeal to the general public, as it explains radio in terms anyone can understand. It contains four sections, which lead the reader in logical steps from the uses and advantages of wireless, and especially the radio telephone, logically through the principles and apparatus used in, first receiving and then transmitting. Valuable operating directions are given for operating both receiving and transmitting equipment; these in particular are exceedingly valuable, as heretofore most novices have had to learn by experience the methods here described in print. The book, which sells for 35 cents, closes with a section containing some exceedingly valuable general information, including laws and regulations, vacuum tube hints, glossary, and a complete price list of R.C.A. equipment.

The Ace binding post

The Ace Binding Post

THE H. H. Eby Manufacturing Co., 605 Arch st., Philadelphia, have designed a new binding post which they have named "Ace." It has a nickel-plated brass base with solid 8-32 threaded stem extending approximately ½ inch below the base. The base of the post is heavily knurled to prevent turning when mounted, and a hole is drilled through the neck sufficiently large to take a No. 15 bare wire. It is supplied with a black insulated knob ½ inch in diameter by approximately 7/16 inch high.

The Harko Sr. $20.00

IN the June Issue of THE WIRELESS AGE the advertisement of the Crosley Mfg. Co. showed the price of the Harko Sr. as $16.00. This was an error, the correct price being $20.00

Condensers May Supplant Aerial Antennas

By Walter B. Clausen

RESEARCH experts in high frequency oscillatory wave action declare that experiments under way in Government laboratories, as well as on the Pacific coast indicate that static interference may be conquered and aerial antennas dispensed with through perfection of a compact high tension condenser with minimum energy loss. Astonishing results have been reported in Washington in the preliminary stages of the investigation, and still more marvelous experiments are reported from Los Angeles. In the latter place what is declared to be the most perfected condenser ever built, one with a minimum energy loss, is the subject of experiments. In Washington, radio engineers, while not having a condenser of the type utilized by the Los Angeles inventor, have achieved notable accomplishments from preliminary studies with several types of condensers, the construction of which has been known for some time.

The basic principle of the discovery is that the aerial antenna for reception or dissemination of oscillatory waves, is essentially a high tension condenser. Great static losses form what is known as the static interference. This perfected condenser antenna eliminates disturbances and irregularities caused by the ground.

Experiments remain to be made on long distance transmission sets, and it has been suggested that the static season in the Pacific, where transmission and reception between Pearl Harbor, Honolulu; Guam, Midway Island; and Cavite, Philippines, offers a more serious disturbance probably than any other place on the earth, may offer the field in which determination of successful construction of a perfected high tension condenser with minimum energy loss may be had.

The results achieved thus far in the experiments are of special interest to all amateur radio men, as it affords them the opportunity to join in the research work themselves. It is possible some of the amateurs may contribute to its success for even the most advanced radio engineers assert that condensers are far from perfect and condenser action probably offers one of the best keys to the great mysteries of electricity yet unsolved. Analysis of high frequency oscillation waves made possible by development of radio instruments, has in the opinion of many great electrical experts, contributed more to an understanding of the mystery of electricity than any other means.

The preliminary report of the radio engineer at Washington on condenser antennas offers the following interesting suggestion to radio men and students:

"Experiments have been made at the Bureau of Standards upon a special type of antenna for transmission and reception of radio signals. The antenna consists of a pair of metal plates. It is thus similar to the ordinary antenna arrangement, the wires of the ordinary antenna corresponding to one plate of the condenser antenna and the ground below the wires corresponding to the other plate of the condenser antenna.

"When the lower plate of the condenser antenna is on the ground, the two types are practically identical. It is found, however, that raising the lower plate from the ground improves the signals. This type of antenna has the advantage that it is not subject to disturbances and irregularities produced by objects on the ground.

"The work done included the construction of various forms of condenser antenna and measurement of capacity and other electrical properties. This type of antenna was compared with coil antennas which are used as direction finders. For the very short wave lengths such as are used in radio communication by amateurs, the condenser antenna gave more intense signals than the coil antenna of the same general dimensions. Compared with the ordinary antenna with which a ground connection is used, the condenser antenna is markedly free from electrical disturbances."

Of equal value, commercially, to the improvement in transmission and reception by elimination of static disturbance of such a perfect device would be the advantage of portability, for even for the largest sets the size of the compact condenser would be comparatively small.

On the Pacific Coast already the new type of antenna has been installed in a receiving set contained within the cabinet of an ordinary phonograph box. One of the interesting experiments conducted was the transfer of ordinary aerial antenna connections to a compact condenser during reception of a certain station. The immediate elimination of static, great increase in volume and clarity were observed, and in addition signals so weak that they were absorbed by the energy loss in the aerial antenna were clearly picked up and made readable by the compact condenser antenna.

The preliminary type of condenser antenna with which the first remarkable results were achieved in Los Angeles, was of the cylindrical type, a high tension glass condenser registering a minimum of absorption or energy loss. It was of 100 micro-microfarads. This particular type of condenser was constructed for commercial use in automotive ignition, and reached a high state of perfection after years of experimental work and intensive study of condenser properties.

Brush discharge had been absolutely eliminated in the method of construction, rights to which are claimed by the inventor and are the subject of application for letters patent. The dielectric is of pyrex glass of a thickness, in the capacity mentioned above, of two millimeters. The plates of the condenser are of shimstock steel and form a tight bond to the dielectric by friction. The elimination of brush discharge is effected by a seal of petrolastic cement of a special degree of hardness. The type of condenser with which particular success has been achieved was of .001 microfarad capacity.

The antenna of radio reception in the last analysis being primarily but a condenser, it seemed but natural that investigation of utility of condensers built with more thought of condenser principles in construction than the type of antenna now in use with its enormous loss factor, it being an air condenser, would be prosecuted by radio research experts, and inquiry developed that the naval radio laboratory of the Bureau of Standards at Washington is making some intensive tests. The Washington tests, however, were made without access to the particular type of condenser antenna in use by the Los Angeles inventor.

Success of the loop aerials and of subterranean antenna, particularly in naval work across the Pacific where static during summer months so seriously interferes with transmission, gave new avenues of investigation leading away from previously held opinion that the higher the antenna the more favorable for reception of signals.

Experimental work in Los Angeles is merely scratching the surface, in the opinion of investigators, and one of the next stages of experimental work will be with condensers of spherical construction. Thus the subject should be one of unusual interest as offering interesting possibilities for radio students and investigators, of contributing to the advancement of radiotelephony and radiotelegraphy by investigation and experimental work along the lines of treating the antenna as a condenser and seeking development of its utility along such lines.

In a report of the experiments so far conducted, J. C. Warner, the assistant physicist of the radio laboratory of the bureau, says:

"Experimental results show that a condenser antenna of small dimensions gives excellent results when used at wave-lengths below 400 meters. At longer wave-lengths it suffers by comparison with the coil antenna when the dimensions are kept small enough for portable use.

"It is useless for directional work unless used with a coil antenna, but may be used in places where the sharp directional characteristics of the coil are objectionable. By proper design and by taking precautions to keep dielectric losses low the effective resistance may be reduced to a value lower than can be obtained either with the coil antenna or the ordinary elevated antenna.

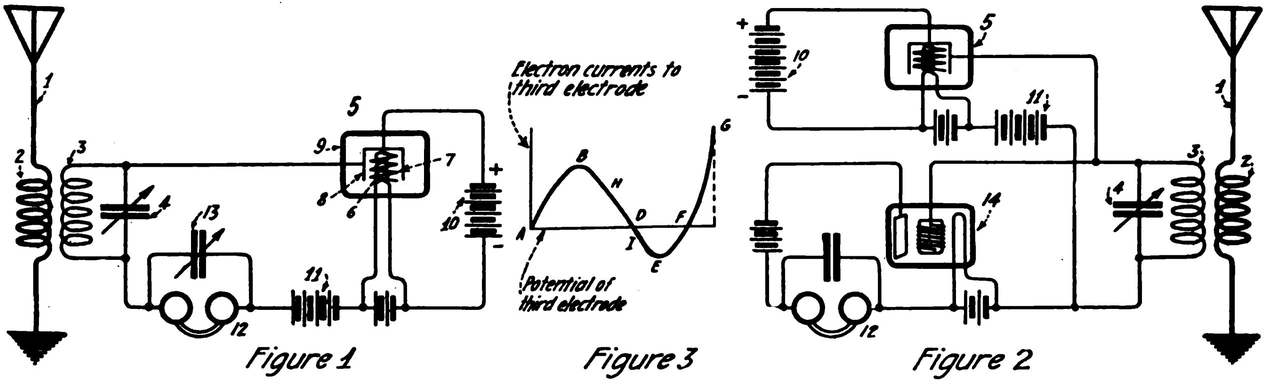
"On acount of this low resistance and ease of construction this form of antenna should be of great value in portable short-wave radio stations, such as are used for military purposes and on airplanes, although in the latter case some difficulty may be experienced in keeping down dielectric losses.

"It is evident that the study of this interesting form of antenna is by no means complete. Its use as a transmitting antenna offers a wide field for investigation, and a large amount of work remains to be done in following up the investigations which have only been started in this study. For example, signal intensity measurements should be made with a calibrated detector set or with a radio-frequency comparison method, so that the actual current or E.M.F. in the antenna is measured. Further work should be done in determining the best design of antenna for a given wave length and for minimum resistance. Also, this antenna furnishes a means of studying the form of the electro-magnetic wave, and a large amount of work might be spent profitably in this study, as well as in the checking of transmission formulas."

An Amplifying Circuit

A CIRCUIT developed by A. W. Hull, claims the attention of radio men generally because it is maintained that considerable amplification has been acquired with it in practice.

It is customary in receiving wireless signals to impress the received oscillations upon a resonant circuit and thereby greatly increase the amplitude of the oscillations produced by the received waves in the antenna. Every oscillating circuit has a so-called damping factor which depends upon the resistance of the circuit and this damping factor limits the maximum possible amplification of the oscillations set up in the circuit. An apparatus having a negative resistance characteristic is connected to the oscillating circuit in such a way as to compensate for the positive resistance of the circuit, thereby greatly reducing the damping factor of the circuit and increasing the maximum possible amplification of the oscillations in the circuit.


1
2
3
4
13
12
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8
6
7
10
+
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Electron currents to third electrode
B
H
D
F
G
A
I
E
Potential of third electrode
+
-
10
5
11
14
1
2
3
4
12

Figure 1 Figure 3 Figure 2

Hook-up to secure increased amplification and characteristic curve of the circuit

For receiving continuous wave signals the circuit is adjusted so that the negative resistance apparatus produces oscillations of a frequency slightly different from the frequency of the received oscillations. These locally produced oscillations will then be controlled by the received oscillations in such a way as to produce an audible frequency current in the receiving circuit.

The negative resistance apparatus produces an increase in voltage across the terminals and causes a decrease in the current of positive electricity flowing from the positive terminal to the negative terminal through the circuit, or a circuit in which the differential coefficient $\frac{dE}{dI}$ is negative where E is voltage across the terminals and I is the current through the apparatus. The term "current of positive electricity" has been used in this definition in accordance with the usual conception of current flow, although the current in this case is carried entirely by negative electrons.

As indicated in the drawing the receiving system comprises a tuned antenna system with an inductance 2. Inductance 3 with the variable condenser 4 forms the oscillating circuit upon which the oscillations received by the antenna are impressed. Connected in shunt to the oscillating circuit is a negative resistance device 5 of the vacuum tube type. A constant positive potential is impressed upon the anode 7 by means of the battery 10. By varying the potential impressed upon the plate 8 the current in the external circuit between cathode and plate may be made to vary in the manner indicated by the curve of figure 3. For a more complete description of the operation of this apparatus reference may be had to a paper by Mr. Hull on page 141 of the Physical Review of January, 1916. It will be noted from an inspection of the curve of figure 3 that as the potential of the third electrode is increased up to a value corresponding to the point B on the current curve the current in the external circuit will increase. As the potential is further increased to a value corresponding to point D the current will decrease from the value B to zero. If the potential is increased to a value corresponding to point E on the current curve the current will flow in a direction opposite to its original direction. Further increase in the potential of the third electrode causes the current to decrease again to zero at the point F and then increase in value in the original direction. The point G on the curve indicates the value of the current when the potential of the third electrode is equal to that of the anode 7. By properly designing the circuit the greater part of the portion B E of the curve may be made to be practically a straight line. Over this working range the apparatus has a negative resistance characteristic, that is, the current through the device increases as the potential applied thereto decreases.

Mr. Hull has shown mathematically in a paper on "The Dynatron," published in the Proceedings of the Institute of Radio Engineers, February, 1918, that the damping factor of the system is equal to $\frac{R}{2L} - \frac{1}{2Cr}$ where L and C represent the inductance and capacity respectively of the circuit and R and r the positive numerical values of positive and negative resistance. From this it will be apparent that if the value of the negative resistance is so proportioned to the positive resistance of the circuit that the product of the two is equal to the ratio of the inductance of the capacity, the damping factor of the circuit is zero, that is, the resonant value of current or voltage in the circuit is infinite except as it is limited by the length and straightness of the position B E of the current curve of the negative resistance. Since the amplitude of the resonant current in the circuit is limited by the length and straightness of the negative resistance part of the curve, it is evident that if the device is operated in a region very near one end of the curve as at H or I, figure 3, the current will be asymmetric and the apparatus may be used as a detector as well as amplifier. The battery 11 supplies the necessary potential for the plate in order that it may operate upon the desired portion of the current curve. For the purpose of detecting the signals a telephone receiver 12 with a variable condenser 13 across its terminals is inserted in the circuit. The distributed capacity across the turns of the telephone winding offers a low resistance to radio frequencies and hence the telephone does not interfere with the amplification. The high inductance of the telephone, however, will cause the circuit to oscillate at audio frequencies unless its resistance also is very high. The condenser 13 across its terminals, if properly adjusted will prevent the setting up of undesirable audio frequency oscillations. The capacity 13 and the negative resistance may be so adjusted as to neutralize the resistance of the telephone for the particular audio frequency, determined by the product of the capacity 13 and the telephone inductance, and if this frequency be made the same as the group frequency of the incoming waves the sensitiveness may be greatly increased. In making this and other adjustments the value of the negative resistance may conveniently be varied by varying the temperature of the cathode 6.

The sensitiveness of the system is the same whether the damping term $\frac{R}{2L} - \frac{1}{2Cr}$ is positive or negative. If this term is negative, however, the system will generate oscillations of its own of a frequency slightly different from the frequency of the oscillations impressed upon the circuit. If the received waves are continuous the amplitude of the locally generated oscillations will be controlled by the received waves in such a way as to produce an audio frequency current in the local circuit.

This system offers an important advantage over the usual receiving circuit in that the coupling between 2 and 3 may be made very close without affecting the selectivity since the necessary condition for high selectivity, namely a small damping factor, may still be present. This is true both for the antenna coupling and the coupling to an auxiliary detector circuit if one is used. The fact that sensitiveness and selectivity are independent of both resistance and coefficient makes it possible to use a much more effective ratio of transformation than is practicable with the receiving systems heretofore employed.

In the system shown in figure 2 the negative resistance apparatus 5 is used only as an amplifier and to neutralize the positive resistance of the receiving circuit. In this case an ordinary detector 14 of the vacuum tube type is employed. The oscillating receiving circuit is connected to the grid circuit of the detector 14. The increase in voltage on the grid is opposed in most devices of this type by a leakage current which increases with voltage as in a positive resistance and also by the damping of its own circuit and the coupled antenna circuit. The effect of this leakage and damping may be neutralized by connecting the negative resistance apparatus shunt to the grid circuit as indicated. In this case as in the arrangement of figure 1 the damping of the receiving circuit may be made as low as desired.

Power Modulation for Radio Transmission

A METHOD of modulating the high frequency power used in wireless telephony without requiring the passage of heavy currents directly through the telephone transmitter has been described by Raymond A. Heising. The modulation of the total high-frequency power is secured by varying the impedance of a vacuum tube placed in the antenna circuit. It has been found that thermionic vacuum tubes are well adapted for this purpose because of their relatively high impedance, and because of the fact that this impedance can be varied by means of a telephone transmitter, which is required to handle only a limited amount of power.

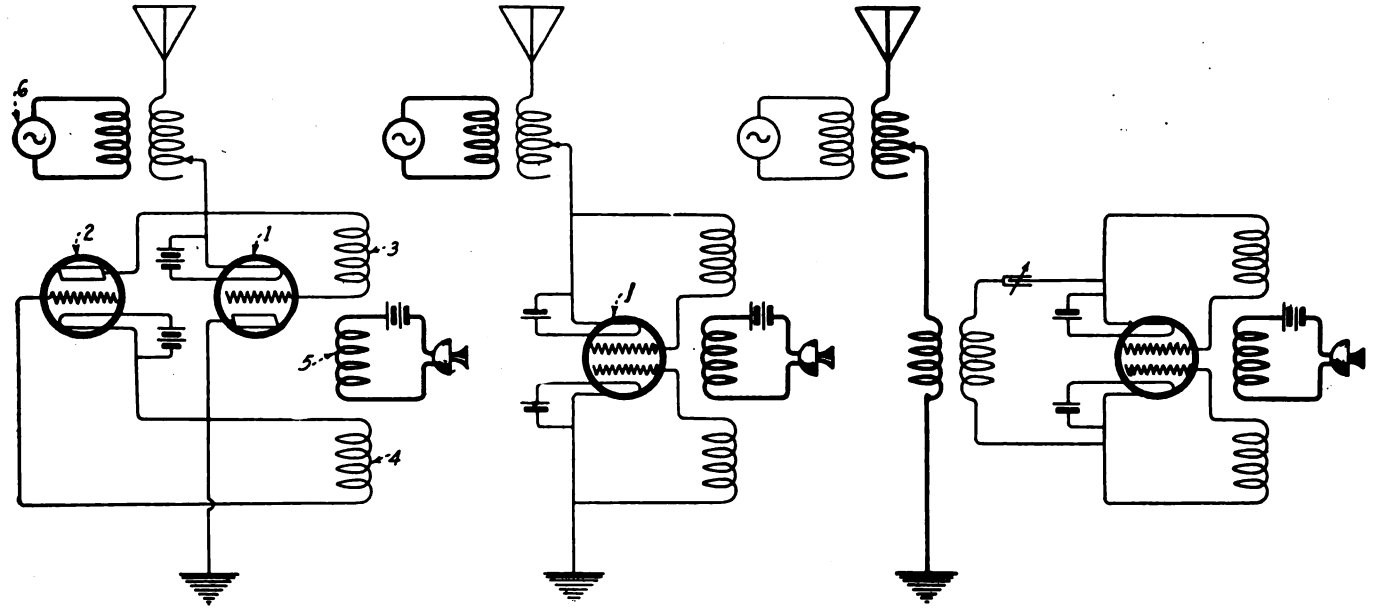


Fig. 1 Fig. 2 Fig. 3

Types of circuits for power modulation in radio telephony

In general, however, a thermionic device is unilateral, and, in order to permit the passage of both halves of the high-frequency oscillations, it is necessary to make the system symmetrical by using two such thermionic impedances suitably connected or by using a specially constructed impedance of this character which is symmetrical.

In figure 1 there is shown in series with the secondary of the transformer a thermionic amplifier 1 of the vacuum tube type having a heating filament, grid and plate, the output circuit of the amplifier being connected to the antenna circuit. In parallel to this thermionic amplifier is placed a similar amplifier 2, which has similar electrodes. This amplifier 2, however, is connected in the reverse direction. This reversal of direction is for the purpose of rendering the antenna system bilateral, in order that oscillations may take place in either direction, because positive current can flow only from the plates to the filaments. Connected to the input circuit of the amplifier 1 is the inductance 3, and to the input circuit of the amplifier 2 is the inductance 4. Coupled to both of these inductances is the inductance 5, which is included in a circuit containing a battery and microphone transmitter. The antenna is grounded.

The operation of the system is as

follows: High-frequency oscillations of uniform amplitude are generated by a generator 6, and are impressed upon the antenna. The amplitude of these oscillations is determined by the impedance of effective resistance of the antenna. If this impedance is varied or modulated in accordance with signals, the oscillations will be similarly modulated. When signals, or control impulses, are impressed upon the microphone, low-frequency currents of low power are impressed upon the input circuits of both tubes by means of the three-winding transformer. The changes in the potentials of the grids bring about a relatively large change in the impedance of these thermionic amplifiers, and accordingly the oscillations in the radiating system are modulated in the same manner.

Figure 2 shows a modification in which the two amplifiers of figure 1 are combined in a single tube. In this case the plates are unnecessary, and accordingly the thermionic impedance comprises merely a tube 1 inclosing the heated electrodes and the grids. In view of the fact that both filaments are heated elements, this device is bilateral; that is, current may flow in either direction. A three-coil transformer with microphone and battery is connected to the input circuits in precisely the same manner as shown in connection with figure 1.

In view of the fact that the impedances shown have a very large resistance, there results the introduction of a large resistance into the antenna. A circuit arrangement by which this difficulty is overcome is shown in figure 3. A transformer is introduced into the antenna circuit, and the secondary of this transformer, consisting of a large number of turns, is connected by a circuit including a variable condenser to such a modulating device as is shown in figure 2. It is obvious that in place of this modulating device the one shown in figure 1 may be used in the arrangement of figure 3. In using this transformer the apparent resistance introduced into the antenna may be made of any desired value.

In general, the antenna is tuned to the sending frequency, which is the frequency of the generator, and the value of the current flowing in the antenna circuit will depend only upon the voltage impressed and the sum of the resistance of the antenna, the coil and the resistance introduced by the tubes. In all the modifications shown the modulation is produced by the variation of the effective resistance in the antenna circuit, which variation is due to the variations of the tubes. For complete modulation, it is, therefore, necessary that the resistance introduced by the tubes be large enough to reduce the high-frequency current in this circuit to zero, when the low-frequency input to the modulating device has its maximum negative value. It is also necessary for efficiency that the resistance of the tubes become very small when the low frequency output has its maximum positive value.

It is important that the transformers 3, 4 and 5, be so connected that both grids are at all times of the same sign with regard to their respective filaments.

A High Potential Condenser

Mr. ELIHU THOMPSON has recently developed a high-potential condenser which consists of a plurality of condenser elements in series relation in such a way that an electrode of each element serves also as an electrode of an element adjacent thereto. Terminals are provided for the first and last elements only of the series so that when a high voltage is applied to the terminals it will be distributed among all the elements, each individual element being required to withstand only a fractional part of the entire voltage. The electrodes are made of greater thickness than the dielectric which separates them and the edges are rounded off in such a way that there is a gradual tapering away of the surface of the electrode from the dielectric, thereby avoiding the formation of corona discharges at the edges of the electrodes.

As illustrated in figure 1, the condenser comprises a plurality of electrodes 1, super-imposed upon each other and separated by the dielectric members 2. It is noted that with the arrangement shown the second electrode, for example, serves as electrode for both the upper element of the condenser and for the element immediately beneath. In the same way the other electrodes each serve as electrode for two adjacent elements. The end electrodes are provided with terminals 3 and 4 for connection to the distribution system with which the condenser is to be employed. With the construction shown each individual element may be adapted for a moderate voltage and all of the elements in series may be employed with high voltages, the total voltage applied to the terminals being distributed among the individual elements. In the form indicated the electrodes are hollow and the edges are rounded so that the surface adjacent to the dielectric will taper away from the dielectric in a curved line. By this construction the formation of destructive corona discharges at the edges of the electrode may be avoided. It will be seen that the electrodes may be made solid instead of hollow, but this would involve the use of a much larger amount of metal and no appreciable advantage would result therefrom since it is only the metal near the surface which plays a part in the operation of the condenser. It is, however, essential, that the electrodes should have an appreciable thickness with relation to the dielectric in order that the desired rounding off of the edges may be secured. I have shown the dielectric members as being dish shaped for convenience in holding the parts in the proper relation to each other. This construction also allows any gas bubbles which may form on the under surface of the dielectric to readily rise when the condenser is immersed in an insulating material

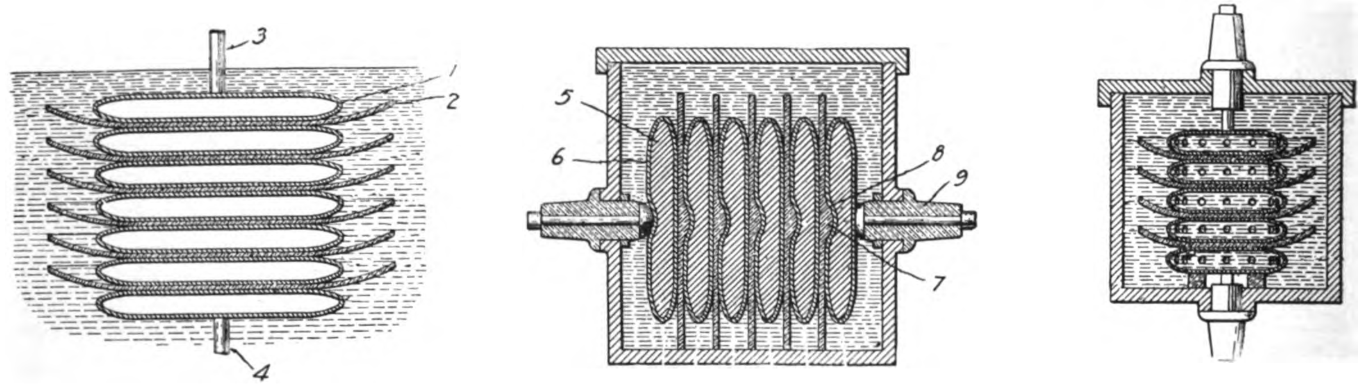


Figure 1 Figure 2 Figure 3

Constructional details of the high potential condenser such as oil, as indicated in the drawings.

Figure 2 shows the condenser entirely inclosed in a case which may be made either of metal or of insulating material, as desired. In this case the body 5 of the electrodes is composed of any cheap material which may be non-conducting if desired, and this body is covered by a conducting coating 6 which serves as the electrode proper. The coating in effect constitutes a conducting shell which has been reinforced by a suitable filling. In this case the units being assembled in vertical instead of horizontal planes, projections 7 are provided on the sheets of dielectric material which fit into corresponding depressions 8 in the electrodes, and thus serve to hold the electrodes in proper relation to each other. In case the container is made of conducting material, insulating bushings 9 of any desired form may be employed for insulating the terminals from the casing.

Figure 3 differs from figure 1 in that the electrodes are hollow and provided with perforations which allow the insulating material, in which the condenser is immersed, to penetrate the interior of the electrodes. This will prevent any tendency of the electrodes to float and will also provide for a better cooling of the electrodes in case the insulating material in which the condenser is immersed consists of a fluid which is adapted for cooling purposes.

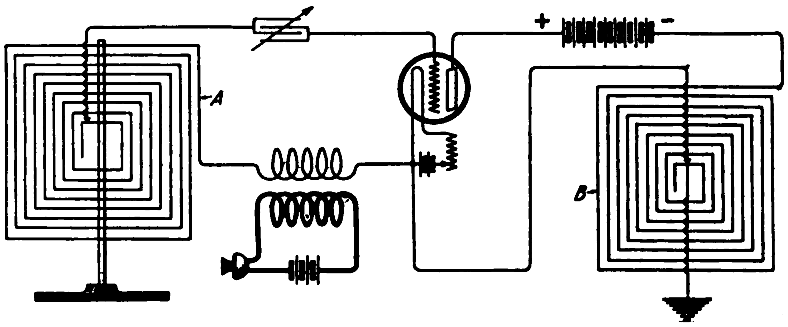
Tuning Loops Used For Transmission

HENRY K. SANDELL describes a novel circuit, which uses coupling coils as the radiators or antenna.

Figure 1 shows a vacuum tube used as a generator of oscillations. The plate is connected to the positive pole of the "B" battery and the output circuit is completed by the connection to the negative side of the "B" battery, the loop aerial, and the conductor leading to the filament. The loop B is grounded through a variable contact to which is also connected the filament lead. The grid condenser should be of low capacity and is connected to aerial loop A through a variable contact.

The loop for the aerial A is rotatably mounted upon a suitable standard from which it is insulated, and is placed in proximity to the loop B of the output circuit, as indicated in figure 1. Its angular position relative thereto may be varied by rotating it to any desired position.

In operation, on closing the plate circuit, the reaction produced upon the loop A in the intake circuit results in the production of oscillating currents in the output circuit, the two loops acting as a coupling for the production of this effect. By varying the angular position of the loop A relative to the loop B, the adjustments for most efficient operation may be readily determined. By use of the microphone variations in the current in the input circuit may be produced, which are reproduced in the output circuit by which they are transmitted as impressed upon the oscillating circuit. It is seen that the signals may be directly impressed upon the output circuit instead of upon the input circuit, but the latter method is preferred on account of its greater efficiency as demonstrated by practical operation.



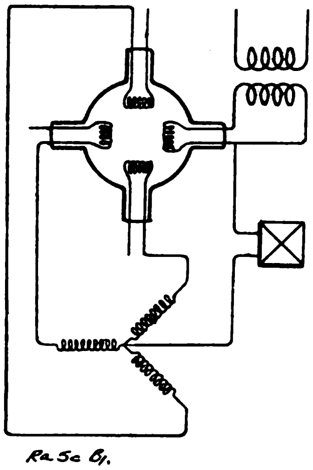
Circuit showing coupling coils used as the antenna

Improved Alternating Current Rectifier

G. HOLST and E. Oosterhuis of Eindhoven, Holland, have developed a tube for rectifying alternating current which is a step forward in the way of economy.

For rectifying alternating currents, discharging tubes are used in which one of the electrodes is brought to a high temperature and it then acts as a cathode. Generally the cathode is constructed as an incandescent filament while the anode is usually constructed in the form of a sheet or a rod.

In the new tube of this type, however, the electrodes are constructed so that they can be used successively either as incandescent cathodes or as anodes, while an electrode which is no longer fit for use as a cathode can then be used as an anode. This construction extends the life of the tube. In case the incandescent filament is burned out, one of the other electrodes is used for this purpose while the defective incandescent filament can be used as an anode.



The rectifier for three-phase current

The drawing shows a rectifier for three-phase current. The rectifier consists of a discharging tube in which four spirals of tungsten or other suitable material are used. One of the spirals is brought to incandescence. The three others are used as anodes. If the first spiral is burnt out, one of the others can act as the cathode and this can be repeated until none of the four spirals is any longer fit for use.

EXPERIMENTERS' WORLD

Views of readers on subjects and specific problems they would like to have discussed in this department will be appreciated by the Editor

Radio Frequency Amplifiers and Their Application to Loop Reception

By Abraham Ringel, A. I. R. E.

FIRST PRIZE $10.00

FOR the average radio amateur, who wishes to increase the range of his receiving set, radio frequeny amplification is an invaluable asset. It is a blessing to those unfortunates who are forbidden the use of outdoor antennae by their hard-hearted landlords. Although the writer holds no brief for the latter, he can very well understand the position of the owners of large apartment houses, in refusing to have the premises disfigured by some ten or twenty antennae.

In fact, the close proximity of a number of antennae, all tuned to the same wave length, is not conducive to good reception. It is very well known that conductors tuned to a certain wave length tend to increase the resistance at that wave length of any aerial in the neighborhood. As a result, the received signal becomes noticeably weaker. The general use of regenerative receivers for broadcast reception is also an important factor, especially when the receiver is on the verge of oscillation. Even a slight change in tuning will then throw the set into an oscillating condition.

This accounts for the fluttering, whistling notes, that are only too often heard when receiving from a broadcasting station. The oscillations which are generated by an oscillating receiver, are radiated and combined with the carrier wave frequency of the broadcast station to produce beats of an audible frequency, in some other receiving set. If the antenna from which the disturbance is radiated is relatively near, the whistling may be several times as loud as the speech or music. Thus we can readily perceive the disadvantage in having receiving antennae close together, aside from the artistic point of view.

The remedy, of course, lies in a judicious combination of radio frequency amplification and loop reception. High frequency amplification, by means of transformers at the short wave lengths, is a problem which has baffled radio engineers of the whole world for a number of years, but it seems as if the engineers of the Radio Corporation and the General Electric Company, have solved it to a considerable extent.

Before considering the amplifier built by the writer, it would be well to study the various methods of amplifying that can be used.

Direct Coupled Amplifiers

a. Aperiodic Plate Circuit—One form of high frequency amplifier, illustrated in figure 1, makes use of auto-transformer coupling between two stages. It is analogous to audio frequency amplification by means of choke coils. Incoming signals are impressed between the grid and filament of the first tube. These oscillations are amplified by the tube, and we get much larger radio frequency voltages across the coil L in the plate circuit, than that in the input.

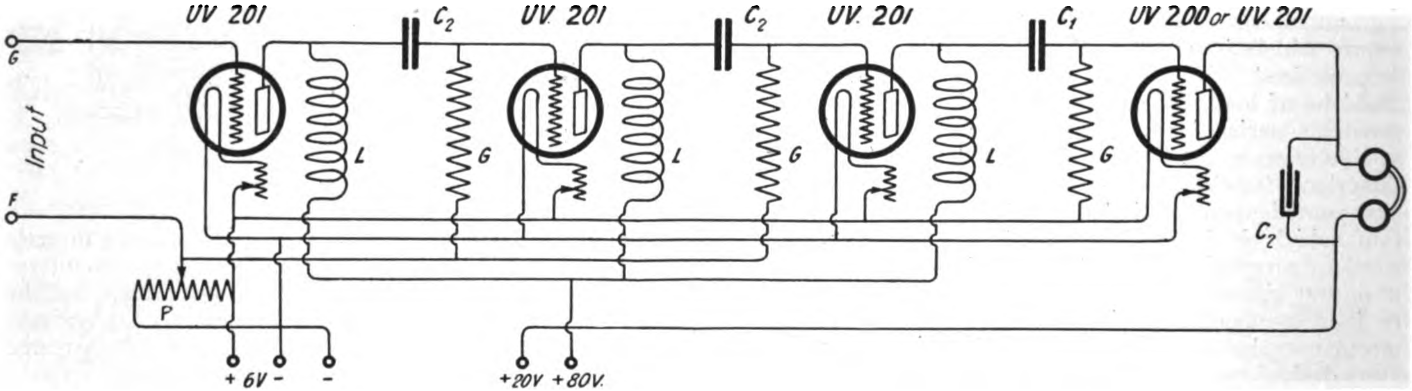


Figure 1—3-stage R.F. amplifier (choke coil coupling) and detector. L—Choke coils. C_1—.00025 mfd. grid condenser. C_2—.002 mfd. phone condenser. G—2-megohm grid leaks. P—Potentiometer.

The radio frequency voltages across L is in turn applied to the grid of the second tube, care being taken to insert a condenser in series, as shown, to insulate the grid from the high plate voltage. In this manner, the original signal is magnified a good many times, depending on the number of stages used.

The coils, L, are aperiodic. To make sure of this, they should be wound of resistance wire, and the turns should be spaced in order to avoid large capacity in the windings. For amplifiers around 360 meters, about 400 turns of about No. 30 Advance resistance wire, on a form about two inches in diameter, would be suitable, but it is best for the experimenter to try coils of various sizes, until best results are secured.

The condensers, C_2, should be of about .002 microfarad capacity. Grid leaks, G, of about 2 megohms are sometimes used to prevent the grids from acquiring a negative charge, and thus plugging the tubes.

b. Tuned Plate Circuit—in direct coupled amplifiers the plate circuits may also be tuned. For short wave lengths a very effective method is the employment of variometers instead of the aperiodic choke coils described above. For longer wave lengths, variable condensers are connected across the coils in the plate circuit. Best results are generally obtained when these coils are as large as possible, and for this reason, the variometer method, which makes use of the capacity of the tube is to be preferred.

In such cases we often run into oscillations in the amplifier, and it is necessary to apply a considerable positive bias to the grids of the tubes. This may be done by connecting dry cells in the grid circuit of the correct value. But a more desirable scheme is to use a potentiometer across the filament battery and connect the slider to the grid leaks in the manner indicated in figure 1. In this way as much as 6 volts positive bias can be given to the grids of the tubes.

The wiring of a tuned plate amplifier is essentially the same as that of an aperiodic plate circuit, shown in figure 1, with the aperiodic coil replaced by either a variometer, or a combination of coil and variable condenser in parallel.

c. Resistance Coupling—Resistance coupling, which is often used in audio-frequency amplifiers to secure distortionless amplification, may also be employed at radio frequencies.

The circuits for a resistance coupled amplifier, are identical to those using choke coils, with the coils replaced by resistances. The resistances should be of the order of 50,000 ohms, when using Radiotrons UV201. Resistance-coupled amplifiers, have, however, certain inherent disadvantages. The plate battery must be at least twice the voltage ordinarily used, and especially built low capacity tubes are required at short wave lengths. Besides, only a portion of the amplification of the tube is available in a resistance coupled amplifier. On the whole, the author does not recommend it for amateur or broadcast wave lengths.

INDIRECT COUPLED AMPLIFIERS

a. Tuned Grid Circuit—A method of high frequency amplification which was used quite successfully by the British Amateurs in copying American stations in the recent trans-Atlantic tests, is shown in figure 2. The received oscillations are amplified by the first tube, and then induced into the tuned grid circuit of the second tube, by means of the magnetic coupling between the coils L_1 and L_2. If the coupling between L_1 and L_2, is made very loose, a high degree of selectivity can be obtained, thus discriminating against interfering signals at slightly different wave lengths. The plate coils may be similar to the aperiodic coils used in the choke coil amplifier. The coils in the grid circuit must be of a suitable value so that the grid can be tuned to the desired wave length. A potentiometer should be used to prevent oscillations in the amplifier. The tuning of a number of stages would present no little difficulty to most amateurs, and it is usually necessary to calibrate each of the tuned circuits in terms of wave length.

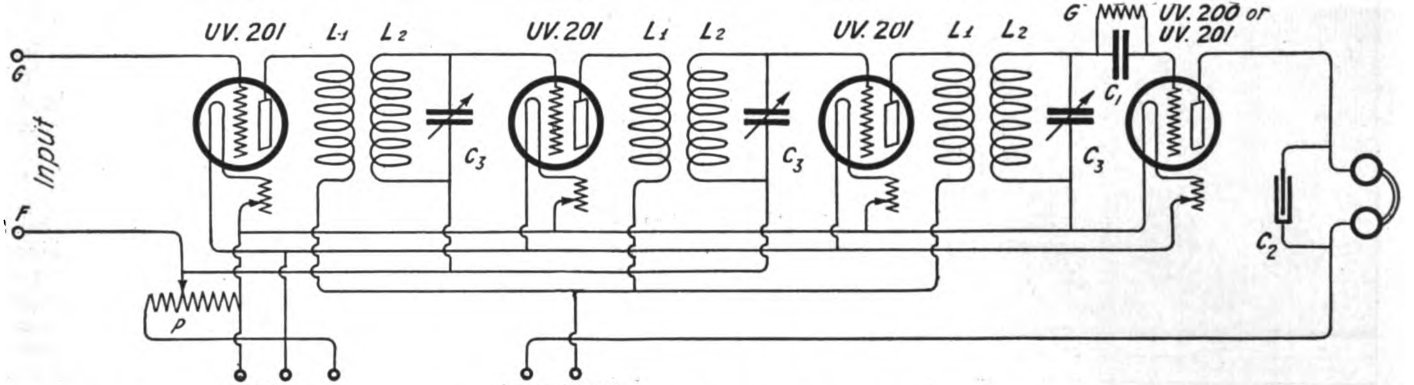


Figure 2—R.F. amplifier (tuned grid type) and detector. L_1, L_2—Coils coupled to each other. C_1—.00025 mf. grid condenser. C_2—.002 mf. phone condenser. G—2-megohm grid leak. C_3—.0005 mf. max. var. condenser. P—Potentiometer

TRANSFORMER COUPLED AMPLIFIERS

Of the methods of radio-frequency amplification so far described, the use of the tuned grid is probably the best, but the additional tuning required, especially if several stages are used, is not likely to appeal to the amateur who already has to cope with half a dozen knobs on his receiver. The radio frequency amplifying transformer fills a long felt want in this direction.

The wiring of a typical transformer-coupled radio-frequency amplifier is shown in figure 3. No tuning adjustment is required, which makes it highly desirable. Note the potentiometer, or stabilizer, which is used to prevent oscillations. The behavior is similar to that of a transformer-coupled audio-frequency amplifier. Incoming oscillations are amplified in the plate circuit, and by means of the transformer coupled to the grid of the following tube. A number of stages may be used with great success and with no more attention than an ordinary a.f. amplifier.

The radio-frequency transformer consists of an aperiodic primary and an aperiodic secondary coil, coupled to each other. Either an air core or an iron core, (Alexanderson high frequency iron about .001 inch thick) are used. The British Marconi Company has standardized an air core transformer, using several hundred turns of very high resistance wire (100 ohms per foot). With very high resistance transformers, coupling condensers of 0.002 microfarad capacity should be connected between grid and plate.

The French radio concerns prefer to use moderately high resistance winding on a core of high frequency iron. The writer has come across a number of transformers of American manufacture. Iron and air core transformers of both high and low resistance windings are used here.

In comparisons and tests the writer has found the Radio Corporation's UV1714 transformer to be superior to most of the others, especially in the neghborhood of 360 meters.

In this connection, a description of the UV1714 transformer will not be amiss. It contains two coils on a core of Alexanderson high frequency iron. Each winding contains several hundred turns of moderately low resistance copper wire, with a tap off taken for the shorter wave lengths. When used within the wave length range of from 200 to 500 meters, part of each winding is short circuited, by means of a special jumper on the transformer. When used on the 500 to 5000-meter wave length range, this jumper is disconnected from one of the terminals, so that all the coil is used. This should be done on both primary and secondary. We thus have a convenient means of amplifying a great range of wave lengths with very little trouble.

The writer, interested only in the shorter wave length range, tested the amplification at wave lengths from 200 to 500 meters. The amplification at 200 meters was quite good, being equal to most of the other transformers which were available. It showed great superiority at wave lengths from 300 to 500 meters.

LOOP RECEPTION, USING RADIO FREQUENCY AMPLIFICATION

In an experimental radio-frequency amplifier, which was set up, the writer has received the radiophone music from WJZ, at Newark, on a three-foot loop, in the basement of a building with a steel framework. This building is located in Upper Manhattan—about fifteen miles away from WJZ. Only two stages of radio frequency, a detector and two stages of audio-frequency were used. The music could be heard comfortably, one hundred feet away, when using an ordinary loud speaker.

The loop in question, contained nine turns of No. 18 lampcord, wound on a frame 3 feet by 3 feet. The turns were spaced one-half inch apart, in order to have as low a distributed capacity as possible. This loop tuned to 360 meters, with the condenser shunting it, a Wireless Specialty Company, Model U.C.1820, at 50 degrees. For amateur wave lengths, it is recommended that the number of turns in the loop, be cut down to six instead of nine.

The schematic arrangement for connecting the receiving circuit to the radio frequency amplifying detector, and audio frequency amplifier is shown in figure 4.

CONSTRUCTION OF AMPLIFIER

Although very good results were secured with only two stages of r.f. amplification, it was decided to use three, in order to be on the safe side. The radio-frequency amplifier was built to conform with a detector and two-stage audio-frequency amplifier, already available.

The general construction scheme is shown in figure 5. It consists of a vertical panel, 10 inches high by 11 inches long, of ¼ inch bakelite, on which are mounted the control elements; such as the three rheostats and a potentiometer. In back of the panel are two horizontal shelves. On the upper shelf, three tube sockets are mounted, and on the lower, three radio frequency transformers. This arrangement was selected because the leads connecting grid and plate of the tubes to the transformers, could be made extremely short.

This is of great importance, especially with short wave lengths, where capacities of the

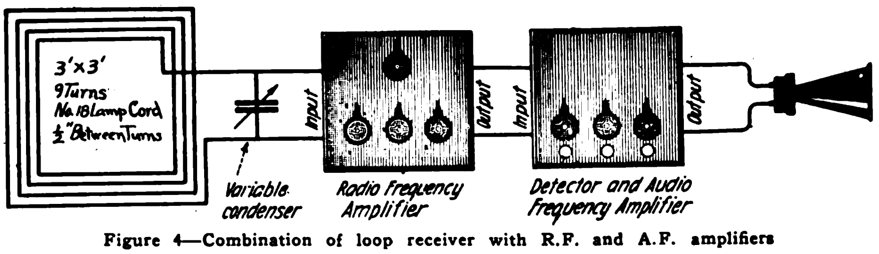


Figure 4—Combination of loop receiver with R.F. and A.F. amplifiers

connecting wires are of great importance.

The detector and two-stage audio amplifier runs along similar lines; with the tubes in the upper shelf, and the transformers below. In addition, the upper shelf contained grid condenser and grid leak for the detector, and grid leaks used in shunting the primary winding of each audio-frequency amplifying transformer, the reason for which will be explained later.

Input and output binding posts are on either side of the base, and battery posts are in the rear. Thus the set is not disfigured by unsightly wires in front of the panels. Jacks are so connected that the loud speaker may be plugged in on any stage desired.

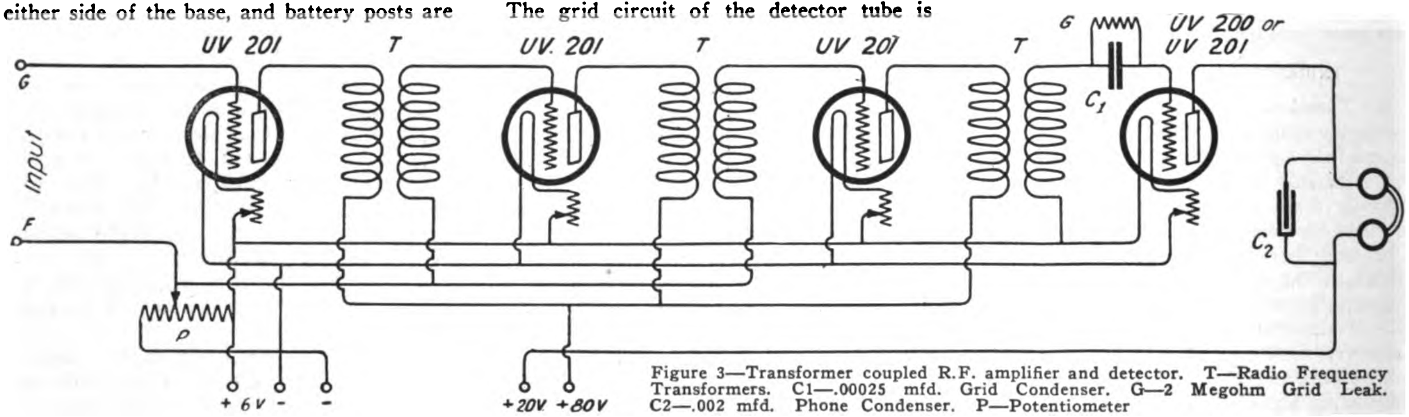


Figure 3—Transformer coupled R.F. amplifier and detector. T—Radio Frequency Transformers. C1—.00025 mfd. Grid Condenser. G—2 Megohm Grid Leak. C2—.002 mfd. Phone Condenser. P—Potentiometer

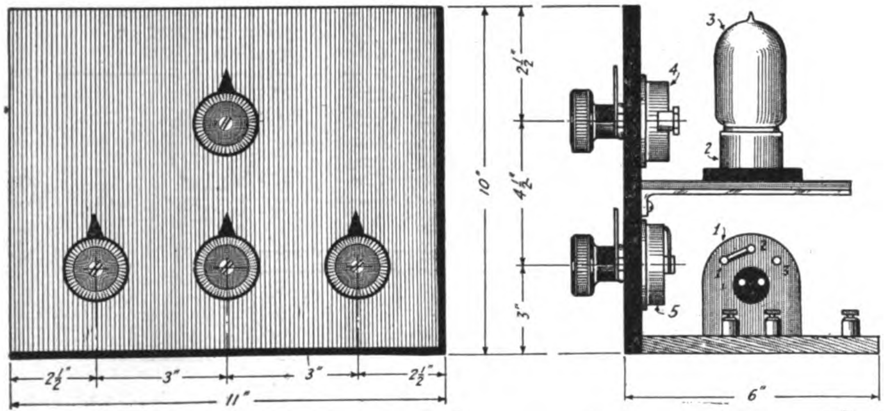


Figure 5A—Constructional dimensions of the radio frequency amplifier panel. 1—UV 1714 R.F. Amplifying Transformer; 2—Radio Corp. UR 542 Tube Socket; 3—Radiotrons—UV 201; 4—A-Battery Potentiometer—PR 536; 5—Filament Rheostats

The wiring of the combined radio and audio-frequency amplifiers is shown in figure 6. Note that a potentiometer is used to bias the grids of all three r.f. tubes. The input terminal marked G, connects to the grid of the input tube, and that marked F, to the slider of the potentiometer. It is advisable to connect a condenser of 0.002 microfarad between the slider and one side of the filament battery, as shown, in order to provide a by-pass for the radio frequency.

The plate of the first tube contains one winding of a UV1714 transformer, as a primary, the other winding being connected to the grid of the following tube. It is important that the terminals 1 and 2 of each winding be short circuited by the jumper provided, and terminals 3 be connected to grid and plate. These leads should be as short as possible in order to avoid excessive capacity.

The tube sockets were selected with special care for the same reason. The Radio Corporation's porcelain base socket, model UR 542, was used, not only because of the small capacity between the spring contacts, but also because of the reliable contact made with the prongs on the base of the tube. With some of the cheaper sockets on the market, this contact is so poor, it is necessary to solder the tube to the socket, in order to obtain reliable action. The importance of this point cannot be over-emphasized. The entire set may be inoperative because of a single imperfect contact point.

Any of the rheostats now on the market are suitable. For the potentiometer, the Radio Corporation's modoel PR536 is about the best.

Detector and Audio-Frequency Amplifier

The grid circuit of the detector tube is coupled to the plate of the last r.f. tube, by means of another UV1714 transformer. Detection is accomplished by means of a grid condenser and grid leak, the values being 0.00025 microfarad and 2 megohms respectively. It is advisable to use the Radio Corporation's condensers and leaks, which are designed to fit their standard grid leak mountings. In this way the experimenter may easily determine for himself the best values for these elements. Provision is made in the plate circuit of the detector for a tickler coil or plate variometer for regeneration, or oscillation for receiving C.W. These terminals are short circuited, when no regeneration is required.

The audio-frequency amplifier is wired in the usual manner (see figure 6). It is necessary to connect a condenser of about 0.0025 microfarad capacity across the primary of the first transformer in order to provide a by-pass for the radio frequency oscillations. The loud speaker or telephones may be plugged in on any stage of the amplifier, by means of jacks as shown in the wiring diagram. The transformers are Radio Corporation's UV712's, which are especially designed to match the Radiotron tubes.

The unusual feature of the amplifier is the connection of resistances of 1 megohm across the primaries of each transformer. This helps to broaden the characteristic curve of the amplifier, so that it responds equally well to low frequencies as well as high frequencies. In this way speech and music are amplified with very little distortion.

In order to receive music properly we must include a range of frequencies between 200 and 5000 cycles per second. This takes in the lowest baritone and piano notes, and the highest soprano, and practically all the harmonics or overtones, which are required for good quality. Standard grid leak mountings should be used so that the amateur may decide for himself the proper resistances to use, by experimenting with grid leaks of different values. This practise results in a slight decrease in signal strength, but this loss is more than compensated for by the vast improvement in the quality of the speech or music.

The loud speaker is improved by the use of a condenser of 0.05 microfarad capacity connected across it. This also helps to bring in the lower notes, and tone down the higher ones, which most loud speakers seem to favor. When using this condenser, the experimenter will probably observe that the S's in the radiophone speech are no longer present. This is due to their absorption by the condenser of extremely high sound frequencies. (The S's have a frequency of about 6000 cycles per second and are thus absorbed by the condenser which has a low reactance at this frequency, when compared with that of the loud speaker.) But it seems worth while to make this sacrifice, in order to obtain good music. The condensers may be ordinary paper condensers, obtained from the Federal Telephone and Telegraph Company of Buffalo, New York.

It is important to use UV201 Radiotrons, in both the r.f. and a.f. amplifier, inasmuch as the transformers are designed for these tubes. For the detector, a UV200 or a UV201 may be employed. The plate voltage of the amplifier tubes should be 60 to 80 volts, and that of the detector, 22.5 volts. Any reliable make of B-battery is satisfactory. The filaments are run off a 6-volt storage battery of about 80 ampere hours capacity.

Operation of Amplifier

The following procedure should be followed when using the amplifier with a loop receiver. First adjust the filaments of all the tubes, so that they are a bright yellow. Then set the slider of the potentiometer at about the middle of the resistance. Now tune with the condenser across the loop for the desired radiophone station. Leave the condenser at this setting and rotate the loop until the music is loudest. Readjust the potentiometer, obtaining the best possible signal. At this stage it may be necessary to retune the loop slightly. The temperature of each filament should now be varied until the very best results are obtained. As a matter of fact, once the filament rheostats are set, it is unnecessary to alter their position any further. Thus only two adjustments are actually required: 1. Tuning condenser. 2. Potentiometer. The potentiometer setting for optimum signals is not the same for all wave lengths. It is therefore important to change it when tuning to a different wave length.

The amplifier can be used with an ordinary short wave regenerative receiver. The terminals of the receiver, usually connected to the detector, are led to the input of the amplifier. The plate variometer is connected to the tickler terminals in the plate circuit of the detector tube. The operation is no more difficult than that of the ordinary regenerative receiver, only one additional control, the potentiometer, being added.

With the increased use of radio frequency amplification, we will no doubt see the gradual disappearance of outdoor antennae for broadcast reception. Roofs and buildings in the crowded urban districts, will no longer be disfigured by a thousand and one heterogeneous aerials. Interference from oscillating regenerative receivers will be considerably abated by the insertion of a radio frequency amplifier which will prevent radiation of oscillations, and fans will really be able to appreciate the fine programs broadcasted.

The dyed in the wool ham, especially the DX man, will not be slow in taking advantage of the opportunities offered by r.f. amplifiers. Not only is the range of his receiver increased, but it also permits duplex operation, the simultaneous transmission on an outdoor antenna, and the receiving on an indoor aerial. The latter may be either a loop, or a few wires strung across the attic.

J. O. Smith of 2ZL fame, has been working duplex all along in this way, and under favorable conditions receives stations located as far away as New Mexico, a distance of 1,800 miles regularly, using three stages of r.f. in addition to his detector and two-step a.f. amplifier.

We are now on the threshold of a new era in radio communication; the elimination of interference from oscillating receivers—a shattering of all DX records. The whole world is our sphere. Let's go!

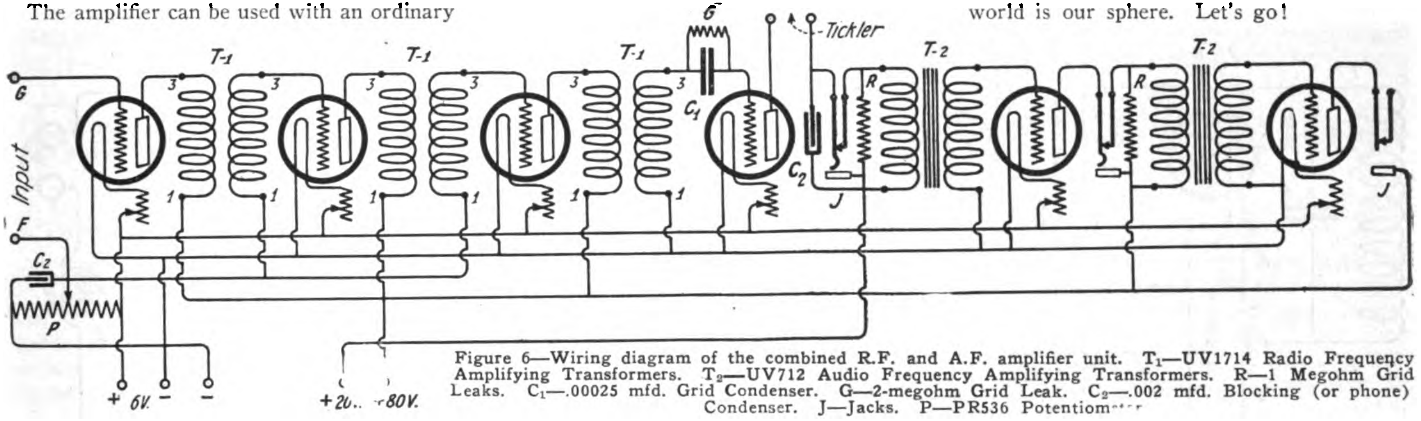


Figure 6—Wiring diagram of the combined R.F. and A.F. amplifier unit. T_1—UV1714 Radio Frequency Amplifying Transformers. T_2—UV712 Audio Frequency Amplifying Transformers. R—1 Megohm Grid Leaks. C_1—.00025 mfd. Grid Condenser. G—2-megohm Grid Leak. C_2—.002 mfd. Blocking (or phone) Condenser. J—Jacks. P—PR536 Potentiometer

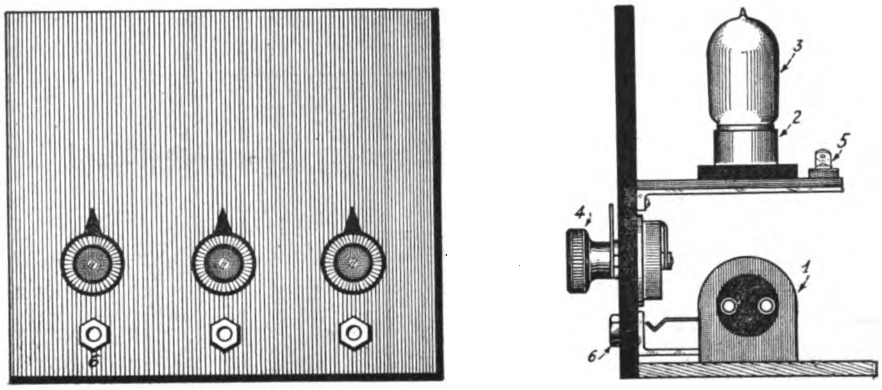


Figure 5B—Detector and audio frequency amplifier—Dimensions same as on figure 5A

A Maximum Receiver

By A. Hazelton Rice, Jr.

SECOND PRIZE $5.00

FOR the man who wishes to obtain maximum results from his radio receiver, a combination of radio-frequency and audio-frequency amplification is indispensable; the only practical limitation to the degree of amplification being the amount of money the experimenter is prepared to invest. For general use, however, amplification at audio-frequencies beyond the third stage is inadvisable for several reasons, unless a loud speaker of the Magnavox type is to be used, and even then, only when it is necessary to give open-air demonstrations to large audiences; first, because of the strain brought to bear upon the diaphragms of the phones and their tendency to "chatter" and second, because of undesirable amplification of tube noises, atmospherics, etc. as well as that most abominable of all goat getters, known as "howling."

Tubes in excess of four, including the detector, also require a second storage battery and the attendant expense of keeping it charged. At this point let me urge the experimenter, who seriously considers the use of vacuum tubes, to purchase a storage battery which has been specially designed for radio work and a battery charger either of the vibrating or tungar type, providing, that he has access to a 110-volt A.C. supply. The latter is more quiet in operation and is generally preferred for its dependability. A battery charger is an excellent investment for it will save its cost many times over, not only through the difference in cost of charging, but by obtaining maximum life from the battery.

To return to the main subject, it would seem that the ideal amplifier is the one which may be constructed and put into operation for the smallest initial expense, and yet is so designed that additional stages of radio and audio-frequency amplification may be installed without necessitating drastic changes in cabinet and panel design.

This article, therefore, will be devoted to the construction of such a detector-amplifier, the operation of which leaves little to be desired.

The Radio Frequency Amplifier

At the present time there are three methods of amplification at radio frequencies in general use: First, the resistance-coupled amplifier. Second, by tuning the plate circuits of the various tubes. Third, by the use of air or iron cored transformers.

Resistance-coupled amplifiers are highly efficient on the higher commercial waves—from 2,000 to 25,000 meters—but due to certain limitations it is impossible to use this method for receiving broadcasting stations on 360 meters or for the amateur wave of 200 meters without the use of an extra tube to heterodyne the signals to a lower frequency.

The tuned circuit method is generally considered efficient, but due to the inconvenience of adjusting numerous dials, has not met with much popularity.

It follows, therefore, that the transformer-coupled radio frequency amplifier is the most satisfactory for reception on the amateur and broadcasting waves, and while the transformers available at the present time are efficient only on a narrow band of wave lengths, we need not be concerned about this for radio-frequency amplification is generally unnecessary on the longer commercial waves due to the enormous powers employed at the transmitting stations.

While r.f. transformers may be constructed by the experimenter, it is better practice to buy them, as the quality and volume of amplification depends largely on their correct design and careful construction. There are several types from which to choose, each of which has its individual good qualities.

For the purpose of the set under consideration, the writer has selected the Mu-Rad, type T-11, manufactured by the Mu-Rad Laboratories of Asbury Park, N. J., not necessarily because of any superiority, but because the retailers seem to be generally supplied at the present time with them. It is well to start with one stage of r.f. amplification and to add the second and third stages as the necessity for them becomes apparent.

All wiring of the r.f. amplifier should be as direct and short as possible in order to minimize capacity effects and the wiring of the grid circuits should be kept as far as possible from that of the plates.

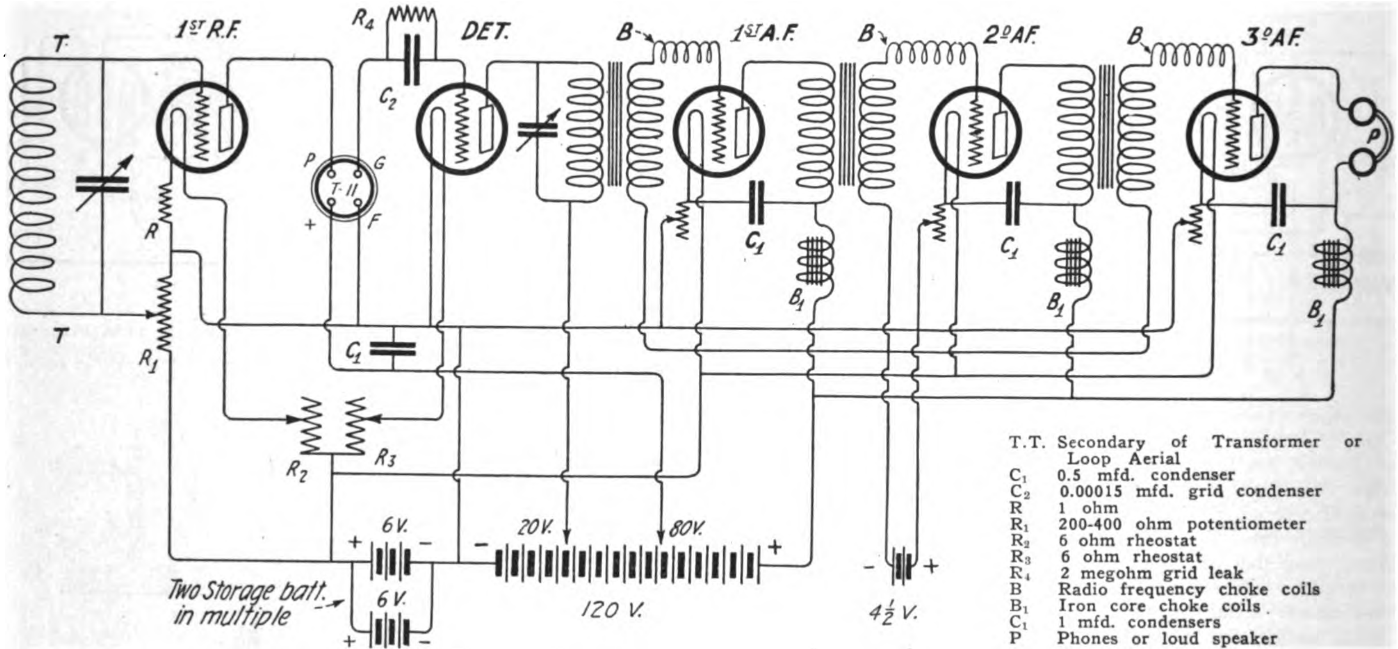
Tube sockets should be selected with care as they are often the source of considerable trouble. They should be of bakelite and not a moulded composition as the latter will not stand up under the heat of the soldering iron. While the spring connections to plate, grid and filament may be positive, it is advisable to solder the tube to them as tubes when properly handled, last for a year or two and it is but little trouble to thus permanently install them and it will generally result in more quiet operation. However, before the tubes are thus soldered, they should be carefully tested in each circuit as it will be found that certain combinations of tubes will work better than others.

The wiring diagram should be carefully studied as the actual wiring of the amplifier progresses in order that costly errors may be avoided. The accompanying drawings allow ample space for two or three stages of radio-frequency amplification, but as stated previously it is better to start with one stage and learn to obtain maximum results from it.

The Detector

Here again all connections should be carefully soldered and the use of binding posts avoided wherever possible. During the earlier days of radio when vacuum tubes first made their appearance, they were exceedingly critical of adjustment and required a potentiometer for close adjustment of the "B" battery voltage. Potentiometers, however, for the adjustment of the plate voltage, are no longer necessary if "B" batteries having the customary 1½-volt taps are used. The detector rheostat, however, (R3 in the diagram) should be capable of micrometer adjustment. Several rheostats of this type are now available on the market.

The length of the "A" battery leads seems to make no difference in the performance of the outfit, but care should be taken to have the "B" battery leads as short as possible.



T.T.	Secondary of Transformer or Loop Aerial
C_1	0.5 mfd. condenser
C_2	0.00015 mfd. grid condenser
R	1 ohm
R_1	200-400 ohm potentiometer
R_2	6 ohm rheostat
R_3	6 ohm rheostat
R_4	2 megohm grid leak
B	Radio frequency choke coils
B_1	Iron core choke coils
C_1	1 mfd. condensers
P	Phones or loud speaker

Figure 1—Wiring diagram of the maximum receiver

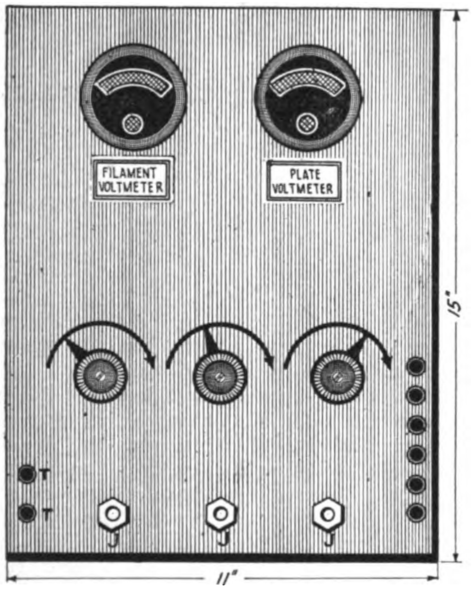


Figure 2

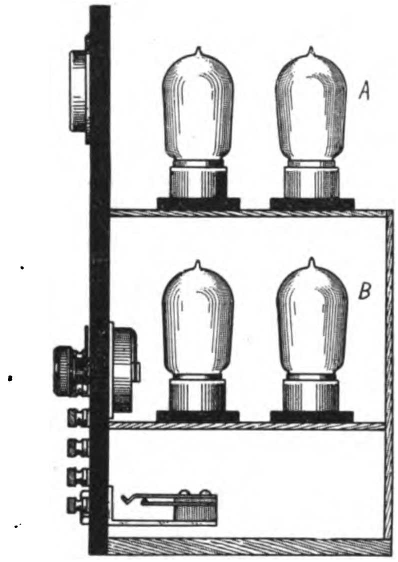


Figure 3

Dimensions of the panel and arrangement of apparatus

The Audio-Frequency Amplifier

The amplifying of signals at audio-frequency to the extent of one or two stages is a comparatively simple undertaking; each stage consisting merely of its transformer, tube and rheostat. The addition of the third stage, however, usually introduces unlooked for complications. It is well, therefore, to take the necessary precautions in the beginning to eliminate howling and secure maximum amplification. This is usually accomplished by thorough shielding of one stage from the other in order to prevent undesirable oscillations being set up. It is sometimes found that a metal cover placed over each tube and grounded and also the grounding and connecting together of the transformer cores is sufficient. It is better, however, to enclose each stage completely in a steel or iron box. This means that the rheostat, tube, transformer and wiring of each stage should be enclosed separately and each metal box should also be grounded. Other refinements which make for increased amplification are found in the connection of the primary of each transformer—in the second and third stages—to the positive terminals of the "B" battery through an iron cored choke coil. A small spark coil or bell ringing transformer primary may be used. A 1-mfd. condenser should then be connected between the filament and choke as shown in the accompanying drawing. Small radio-frequency chokes should also be connected in the grid leads of the amplifying tubes. These may be made by winding twenty-five turns of No. 30 D.C.C. wire on a one-inch tube.

If it is decided that the shielding of the amplifying transformers is too difficult they should be placed as far apart as possible with their windings at right angles, and if less than three stages of amplification are used, it is probable that no trouble will be experienced. It is also important that a .001 mfd. variable condenser be connected across the primary of the first amplifying transformer.

For such an amplifier, storage "B" batteries of the alkaline type are preferable as the "B" battery is often the source of disturbing noises, especially is this true of the so-called block battery, the latter part of its life.

A panel of adequate size and pleasing appearance of ⅛ inch bakelite has been indicated in figs. 2 and 3. However, it is suggested that tubes, rheostats and all other apparatus be set up and connected on a table where there is plenty of room in order that the irregularities of the set may be studied.

When everything is working smoothly and the circuits are thoroughly understood, it is then time to mount the apparatus on the panel. No more dials than are absolutely necessary should be placed on the panel as they detract from, rather than add to, its appearance. For instance the audio frequency rheostats, when once adjusted, seldom require attention and therefore, need not be placed on the panel. Weston filament and plate volt meters, as shown on the panel, are also refinements that assist in the correct operation of the tubes, and hence lengthen their life.

In conclusion the writer wishes it understood that no particular credit is due him for the above as it is merely a compilation of data which is generally accepted as the best engineering practice in the construction of an ultra-modern, super-sensitive amplifier.

Radio-Audio Frequency Amplification

By George J. Smith

THIRD PRIZE $3.00

ON a recent morning daylight disclosed the fact that my antenna had strewn itself over my house and yard and a neighboring garden. Investigation disclosed the fact that the sustaining insulator in the halyard of a 75-foot pipe mast had broken and although the end of the halyard had stuck in the pulley there wasn't any easy way of getting it down.

As the season for long-distance amateur work was over, and as electrical storms loomed in the offing, I decided to confine my activities to reception, at least for the summer. Immediately radio-frequency reception suggested itself, with the probability of being able to use an indoor aerial, in the attic of the house, for receiving purposes.

In the course of time the aerial was built and the set assembled, the latter consisting of three steps of radio-frequency, a detector and two steps of audio-frequency, as shown by the following diagram:

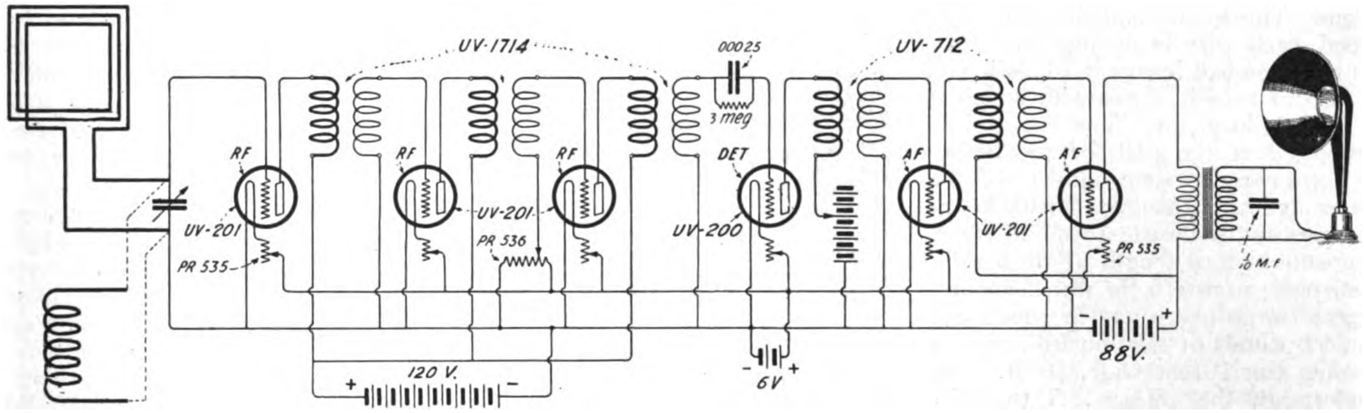


Figure 1—Hook-up of the R.F.-A.F. amplifier

The strength of the signal obtained when the indoor antenna was connected was so great as to indicate that satisfactory results could be obtained with a small loop. One was therefore, built approximately 4x4 feet, with three turns of lampcord, spaced 3/16 inch apart, with which excellent results were obtained. The same was also true of another loop, 3x3 feet, with four turns of wire. Then an experiment was tried with a transmitting inductance, of 3/16 inch copper tubing, approximately one foot in diameter. When 15 turns of this were used, broadcasting from WJZ, WGY, and KDKA came in clear and strong at 50 degrees on a 23 plate condenser. Amateur stations in the First, Second, Third and Eighth Districts were heard in large numbers at 23 degrees on the condenser.

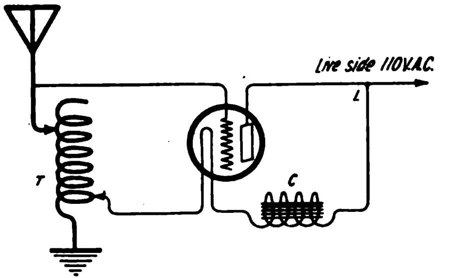
When the set was first installed some trouble was experienced because of oscillation of the radio-frequency tubes. This was remedied by means of the grid-biasing potentiometer across the filament battery leads. The 1/10 mfd. condenser across the leads to the loud speaker was inserted for the purpose of modifying the high notes of instruments or singers. It materially reduces the harshness so often heard in loud speakers.

A. C. on Filament and Plate

By H. F. Shoemaker

THE articles in the April issue of THE WIRELESS AGE on the use of A. C. on the filaments of receiving tubes have prompted me to describe a circuit arrangement whereby A. C. was successfully used on both plate and filament of a 5-watt transmitting tube.

I had one 5-watt Radiotron, but no transformer, so had been using a storage battery to light the filament and 110 volts 25-cycle A. C. direct on the plate with good results. Finally, however, the battery died a natural death and I began experimenting to see if I could apply the same A. C. to the filament. At first without thinking I put an ordinary resistance of the electric iron element type in the position shown at "C" but of course it could not possibly work as the plate was shorted to the filament. Finally an inductive resistance varied by an iron core was put in as shown. This passed the A. C. to the filament, but successfully prevented the H. F. current being short-circuited between the plate and the filament. The point "L" in the diagram is connected to the underground side of the 110 A. C., the ground of the tuning coil "T" acting as the other connection and also supplying the other lead to the filament. Stations several miles away have reported the signals as very QSA on one tube. An ammeter in the antenna circuit indicated about .2 amp. with the storage battery on the filament and about .25 with the above hook-up.



Hook-up for use of A.C. on filament and plate

Consistent "DX" Work by 2 OM

This New Jersey Station Using 1 K. W. Synchronous Spark Set Has Been Reported From Thirty-five States and Has Worked Stations in Thirty-four of Them

RADIO STATION 2OM is located at 180 Broad Street, Ridgewood, N. J., and is owned and operated by F. B. Ostman, Prescott Smith, W. H. Ostman and L. Clark. The antenna is a slanting flat top type of 6 wires on 20-foot spreaders, 35 and 80 feet high, 75 feet long having a natural period of 169 meters. The far high end spreader is a one-inch iron pipe to which is soldered all the wires. The bridle is of rope, and two 10-inch electrose strain insulators are in series with the halyard. The lead-in which is a 10-inch cage is taken from the low end and runs directly through a deck electrose insulator into the operating room. The spreader at this end is of wood, each wire being insulated with an electrose ball insulator. This bridle is also of rope in series with which is a 10-inch insulator. The low end is supported at the peak of the house.

The ground system consists of the water mains, all connected with heavy jumpers and soldered; a well, in which was sunk a long length of tin besides well pipe; a cistern, in which are immersed large plates and in which was put 50 pounds of salt; buried strips of roofing tin, 1 foot wide, 50 ft. long, underneath the antenna. A two-wire counterpoise, triangle shaped, 8 feet high, each wire being 150 feet long, 60 feet apart at far end connected, and extending 60 feet past end of antenna. All leads run direct to secondary of oscillation transformer and are tuned separately.

Because of a barn, high bushes and antenna guy wires, it was not practical to put up more than a two-wire counterpoise.

Antenna system of 2OM station consists of six wires on 20 ft. spreaders, 35 ft. x 80 ft. above ground, total length 75 ft. natural period

It might be well to mention that this counterpoise alone gave 1 ampere more radiation than all the tuned ground system, and with grounds and counterpoise tuned separately an increase of 1¾ amperes was noted.

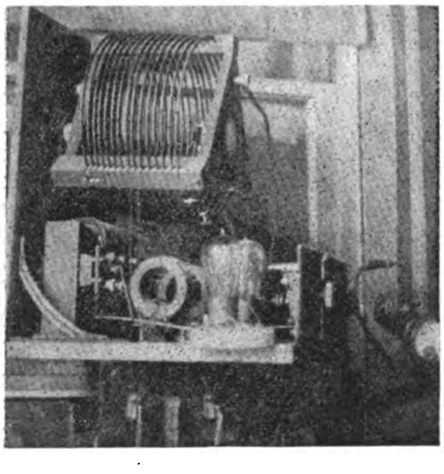
Power is furnished by a separate 110-volt, 60-cycle A.C. supply with No. 10 leads running from meter to switch board. All power leads are in B. & X. cable, gap and primary power mains are protected with large Dubilier kick back preventors.

The spark transmitter consists of a United Wireless 1 kw. 25,000 secondary voltage. Two special .014 Dubilier condensers in series and a large section of glass plate condenser immersed in oil in parallel to these giving an approximate capacity of .014 mfd. The primary of the oscillation transformer is of 3-inch brass ribbon 2 complete turns, but with only one turn in use. The secondary is of ten turns of one-inch brass ribbon, five of which are used. The oscillation transformer is of pancake type, constructed throughout of ½-inch bakelite. The gap is a Grebe synchronous, 8-point rotor, 10½ inches in diameter. Closed circuit leads are all of short heavy copper braid.

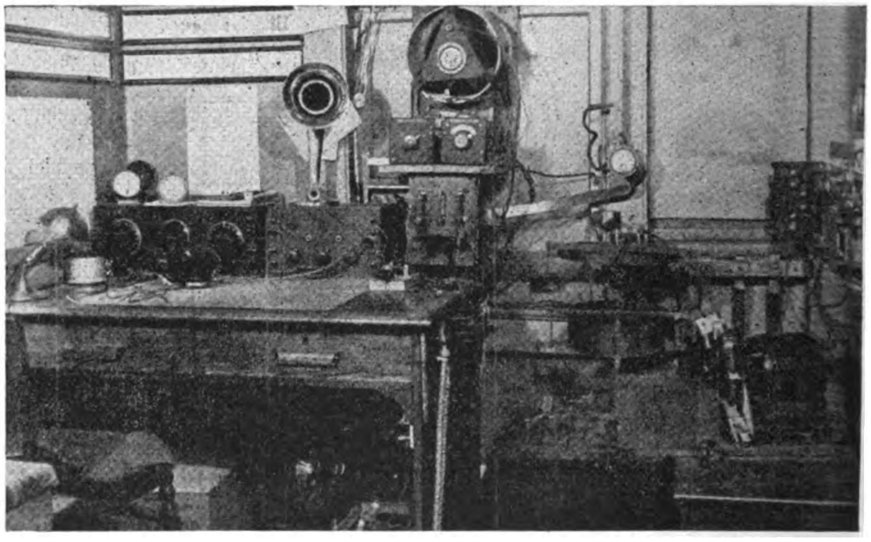
The antenna transfer switch is an angle triple pole switch mounted on half-inch bakelite. The gap and the primary power are controlled by two knife switches on the side of the operating table.

From the lead-in insulator the lead is of 1½ inch brass ribbon to a lighting switch from which this ribbon continues to the antenna switch. In series with this lead is a 6-ampere Western thermo-coupled ammeter, with a clip lead for shorting it out of circuit. On full power the input is 930 watts. Power is varied by the use of taps on a large choke coil and also by means of a sliding core. The normal antenna current is 5½ amperes with a 7-inch coupling.

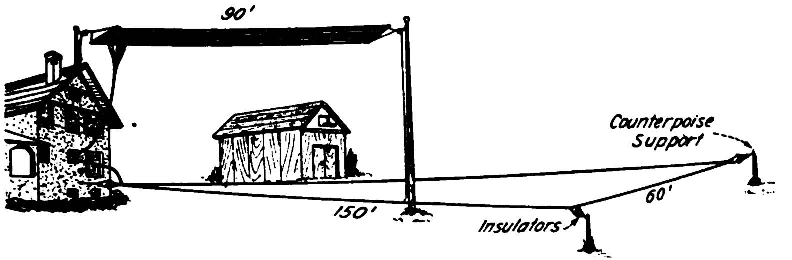
The receiving set consists of a home-made regenerative receiver, one step of radio frequency amplification, a detector and one step of audio-frequency amplification, using Marconi VT II



Self-rectification 10-watt C.W. set of 2OM station which has covered remarkable distances considering the receiver used



Transmitting and receiving equipment of 2OM station, Ridgewood, N. J.

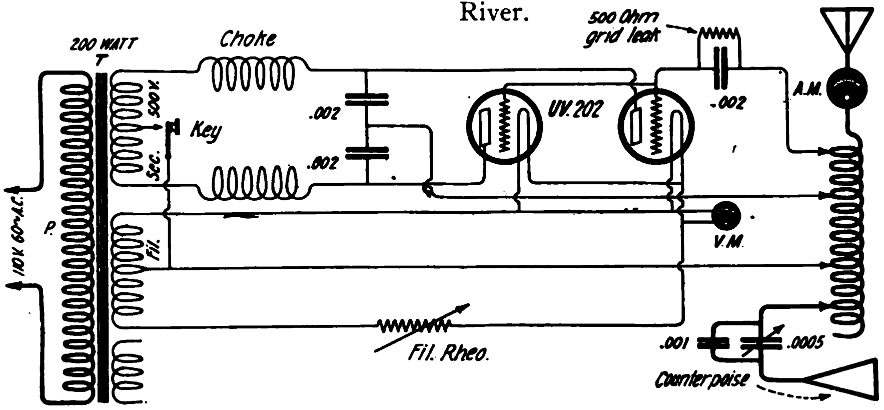


Counterpoise in position with antenna

amplifiers and an E. R. detector tube. A Grebe CR3 and Paragon RA10 has also been used. Signals from all districts have been copied. A variable condenser in series with the ground is used at all times.

The small C.W. transmitter now in use consists of two UV202 Radiotrons in a full-wave self-rectified circuit. The counterpoise ground alone is used with this C.W. transmitter, the normal antenna current being 1.5 to 1.7 amperes. After two weeks in operation, all districts except the 6th and 7th, have been worked with this set—the record transmission being 1100 miles on 10 watts. A 50-watt UV203 is now being installed. 5EK Memphis, Tenn., reported the sigs of 2OM as QSA when using one 5-watt tube, the other having burned out.

Station 2OM has worked stations in 34 out of the 35 states. Reception of 2OM messages has been accomplished in every state east of the Mississippi River.



Full wave self-rectified 10-watt C.W. inductance 15 turns edgewise wound copper ribbon, 10 inches diameter—counterpoise alone used for ground as described

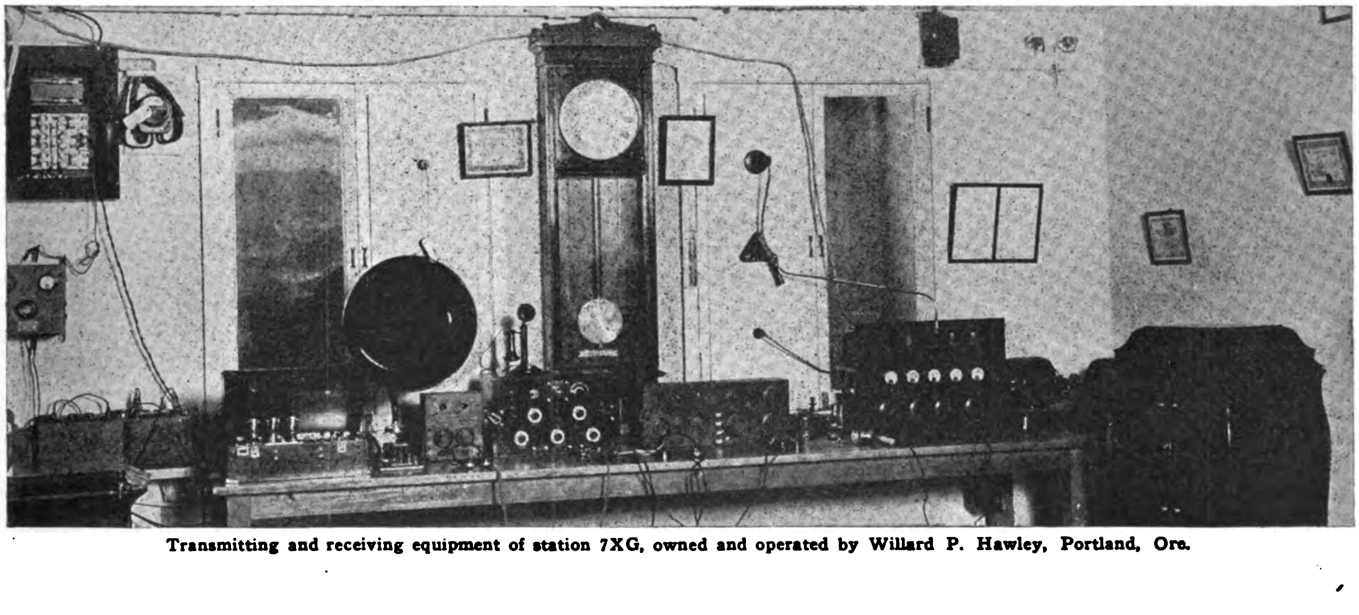
Voice from 7XG Reported from Hawaii

THE Experimental Station of Willard P. Hawley, 400 East 22nd St. North, Portland, Ore., using a C.W. transmitter, call 7XG, has made some exceptional records recently. In one case he has been reported from Hawaii, a distance of 2,500 miles. Four 50-watt Radiotrons UV-203 are used, two as oscillators and two as modulators. The Colpitts oscillation and the Heising modulation systems are used.

To supply the filament current an Acme transformer is used, giving 9.75 volts A.C. on the filament. The plate current is supplied by a Robbins & Myers motor generator set, the motor being a ¾ horsepower single-phase 110-volt A.C. direct connected to a special double-wound generator with a 72-bar commutator at each end, each generator being ¼ K.W., and giving far in excess of the 500 volts required. By connecting the two generator output leads in series a voltage up to 1,500 volts direct current is easily obtained. A voltage regulation from 300 to 1,500 volts is obtained by a 10,000-ohm Ward Leonard rheostat.

At the lower left hand corner of the transmitting panel is a drum switch control which is marked "Voice," "Receiving," "Off," "C.W." and "Chopper." When turned to "Voice," the transmitting panel is ready for the transmission of speech or music, the filaments are lighted, the motor generator is started, furnishing current to the plates and the set is in full working order. The same holds true when control is turned to C.W. or chopper. When the operator is finished with transmitting, the drum switch is always turned to receiving position, and the apparatus is then ready for receiving. To the right of the drum switch control, first, is the wavelength control; second, the coupling control, and third, the condenser control. A chopper, with a 900-cycle note, is used for I.C.W.

The receiving apparatus was designed for short wave work and was built by the Northwestern Radio Mfg. Co. It consists of a plate variometer, grid variometer, variocoupler, primary inductance and primary condenser. This handles wavelengths from 160-450 meters. The 450-900 meter range is obtained by shunting a fixed con-



Transmitting and receiving equipment of station 7XG, owned and operated by Willard P. Hawley, Portland, Ore.

denser in the secondary circuit. Connected to the short wave set is a detector and 2-step amplifier of the same make. For long waves from 600-20,000 meters, a Colin B. Kennedy long wave receiver is used.

The transmitting and short-wave receiving aerial is of the "T" type. The flat top portion is 40 feet long and consists of four wires equally spaced on 10-foot spruce spreaders. Each wire of the flat top portion is insulated at both ends with a Victor insulator. The long-wave receiving aerial is a 7-strand No. 20 phosphor bronze single wire, and is 350 feet long with an average height of 70 feet.

The poles supporting the top portion of the antenna are both 100 feet high and 70 feet apart, each pole weighing 3½ tons and are 22 inches at the base and 8 inches at the top. These masts are one piece and turned true on a lathe, and there are no guys used whatsoever. They are bolted between concrete saddles with 1⅞-inch bolts and do not go into the ground; hence, will not rot at the base.

The lead-in consists of four wires brought together about 50 feet above the ground, forming a rat tail from that point to the instruments. The wire used is 7-strand No. 20 phosphor bronze. A 6-wire counterpoise made up of 7-strand No. 20 phosphor bronze wire runs parallel with the antenna flat top portion, and directly beneath the antenna, the wires being about 1½ feet apart and 70 feet long, and very carefully insulated. The counterpoise extends 15 feet beyond the antenna at both ends. This counterpoise is connected to the inductance on the transmitting set being used in addition to the ground. This gives greater radiation as it reduces the antenna resistance to a minimum. The transmitting set radiates 4 amperes on modulated voice and 5 to 5½ amperes on straight C.W., using two 50-watt tubes as oscillators. The ground system consists of four 60-foot strips of three-inch flat copper ribbon, buried about 8 inches deep, directly underneath the aerial; each strip being spaced two feet apart.

In addition to having been reported from practically all States in the western half of the country, this station has been heard on CW, ICW, and modulated voice in the Hawaiian Islands, near Honolulu, a distance of about 2,500 miles airline.

Pressure and Gas Content in Vacuum Tube Detectors

H. A. Brown and Chas. T. Knipp

Laboratory of Physics, University of Illinois

IN recent years there has been put on the market a class of vacuum tubes knowns as "gas content detector tubes." The advantage of using this type of tube as a detector lies in the fact that it does not require a high-plate voltage for its operation and it is commonly believed that such a tube gives louder response to signals than one having a higher vacuum. The low-voltage vacuum tubes have critical adjustments of plate voltage and filament current to secure the best response to signal currents, but this is not the case for high-voltage vacuum tubes. The purpose of the present discussion is to show from experimental data just how the degree of vacuum and the nature of the gas in the tube affect its operation as a detector.

The pressure of the gas in the tube was varied and readings were taken of the plate voltage for the loudest signal response — called the "operating voltage" — and also of the comparative intensity of signal response for various measured pressures. This was done for several tubes of the same type and for tubes of different types and makes. Measurements of the operating voltage versus pressure were also made with different gases successively introduced into the same tube. Sample or typical curves obtained for pressure variation with the same gas are shown in figure 1.

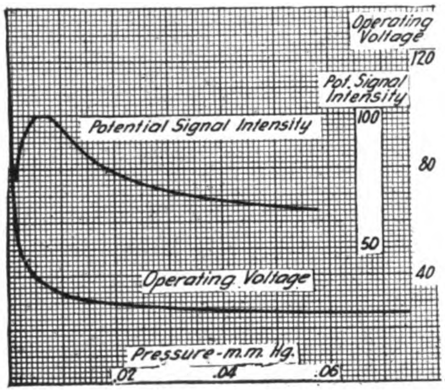


Figure 1—Pressure variation with same gas

The effect of various pressures and kinds of gas upon the critical adjustment characteristics was also measured. The intensity of response passes through a maximum for each pressure as plate voltage or filament current increases. In figure 2 curves are shown for only three pressures although curves were obtained for several pressures. The very small allowable variation of plate voltage at condition of best response at .06 mm. of mercury should be noted. Different gases were successfully introduced into the same tube and measurements were made of comparative best signal response for each gas. The results were arrived at after repeating the test for several tubes, and are summarized at the end of this article. The effect of various gases on the critical adjustment of plate voltage is shown by the dotted curves in figure 2. Measurements were made of the amplification constant and mutual conductance of different tubes with varying plate voltages for different pressures, and typical results are shown in figure 3. Only high and low pressure curves are shown for lack of space. If the amplification constant is a function of the geometry of the tube, the presence of gas alters the effective geometry of the tube as the curves clearly show. When gas is present the amplification constant decreased with increasing filament current above normal values while the measured value of mutual conductance increased. However, the intensity of signal response passed through a maximum for increasing filament current. The variations of the mutual conductance, as shown in figure 2, were very similar to the variations of intensity of signal response with varying plate voltage at different pressures. Data were taken which showed that the characteristic humps in the plate current-grid voltage curves for tubes containing gas were not present when the tube content was helium, the filament being tungsten, nor were humps present for oxide-coated filament tubes containing neon or air.

The tabulated conclusions from the results obtained follow:

1. The degree of vacuum in a detector tube is important. A pressure of .0025 to .005 mm. of mercury gives two or three times as loud response as does a pressure of .05 mm. of mercury.
2. The operating voltage for the most desirable vacua above mentioned is 40 to 50 volts.
3. The adjustments of operating voltage and best filament current are much easier at the above degrees of

vacua, and this fact, with the doubled intensity of audible response fully justifies the provision of a higher plate voltage than is now needed for many low vacuum detector tubes.

4. The operating voltage varies with the pressure in the tube along a curve of the form of $E_o = e_1 (a)^{\frac{1}{P}}$. E_o is the operating voltage, e_1 is probably the ionizing potential of the gas P is the pressure, and "a" is constant. For various gases the variation gives very similar curves.

5. The bend in the above curve occurs at the point of best audibility of response, or .003 to .005 mm. of mercury, and operating voltages of about 40 ot 50 volts. To the right of the bend (increasing pressure) adjustments of operating voltage and filament current become critical.

6. The introduction of neon, nitrogen, or carbon dioxide, does not show any change in audibility or intensity of response from that obtained with air in the tube. Argon gives a somewhat louder response, and helium a slightly weaker response.

7. Hydrogen gives a very much weaker audibility of response.

8. The degree of critical adjustment of plate voltage and filament current for best response is about the same for air, nitrogen, neon, and carbon dioxide. Hydrogen tubes are somewhat more critical.

9. The operating voltage is approximately 30 per cent. higher for helium-filled tubes than for those mentioned above at the same degree of vacuum.

10. The operating voltage is considerably less critical for helium-filled tubes than for any other gas content, and compares with those tubes having fair vacuum.

11. Mercury vapor gives better signal response than the other gases tried, while for the former the operating voltage is lower at similar pressures. The operating voltage for mercury vapor varies from 16 to 22 volts depending on the vapor pressure and hence on the temperature of the walls of the tube. The operating voltage and best filament current are also less critical for mercury vapor than for neon, argon, air, or carbon dioxide.

12. For all of the gases tried the audibility of signal response rises to a maximum as the pressure is lowered below .005 mm. of mercury.

13. The operating voltage at low vacuum depends on the ionization potential of the gas in the tube, but the former is about five or six volts higher than the latter up to pressures of .06 to .08 mm. of mercury. Comparative operating voltages for helium, argon, neon, and mercury vapor tube content shows this to be true.

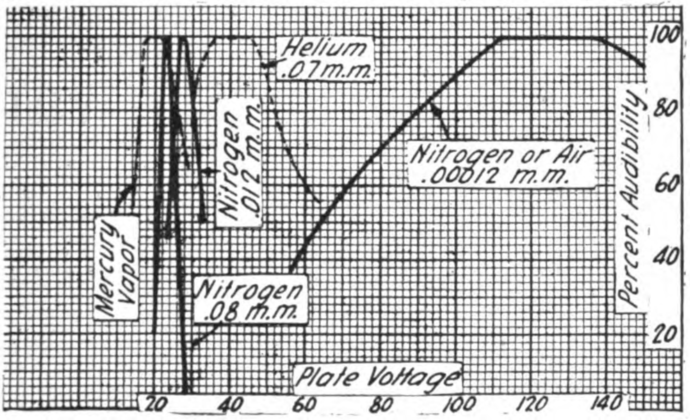


Figure 2—Effect of various gases on critical adjustment of voltage

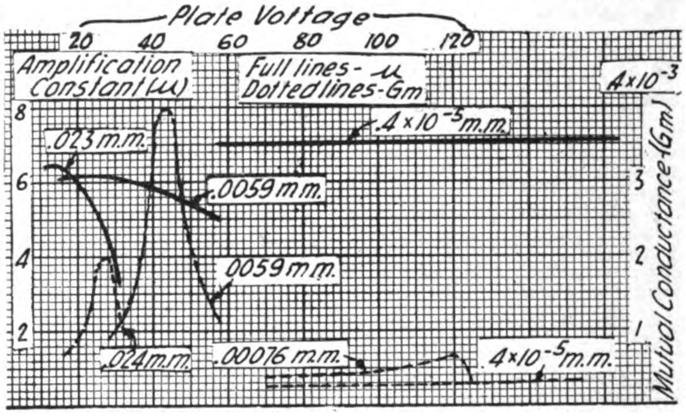


Figure 3—Amplification and conductance under varying plate voltages for different pressures

Revision of British Post Office Regulations Covering Amateur Transmission

THE Wireless Society of London has been advised by the British Postmaster-General that the regulations governing amateur communication have been modified to allow the amateurs greater liberties in transmission. The detailed modifications are as follows:

(1) The restriction that transmission must be confined to five other stations will be withdrawn, on the understanding that the matter transmitted will be confined to communications relating to the experiments in hand and intended solely for the stations actually cooperating in those experiments. The broadcasting of general calls, news, or advertisements, or of matter similar to that which will be transmitted from the proposed broadcasting stations, are expressly forbidden.

(2) Transmission will be permitted for an aggregate maximum of two hours in each 24 hours provided—(a) that no transmission shall commence without previous listening-in on the wavelength which is to be used in order to ascertain whether the proposed transmission is likely to interfere with any other station which may be working, and (b) that no single transmission shall last more than 10 consecutive minutes, and each transmission shall be followed by a period of not less than three minutes listening-in on the wavelength used for transmission.

(3) The following wavelengths will be allocated for amateur transmission:

150 meters to 200 meters inclusive (spark, C.W. and telephony).

440 meters (C.W. and telephony only).

The wave of 1,000 meters for amateur use will be withdrawn.

At the recent annual conference of the Affiliated Wireless Societies of Great Britain a resolution was passed requesting the Wireless Society of London to open negotiations with the postoffice authorities regarding regulations of amateur wireless transmission. As a result a committee of the Wireless Society of London has submitted the following requests to the Postmaster General:

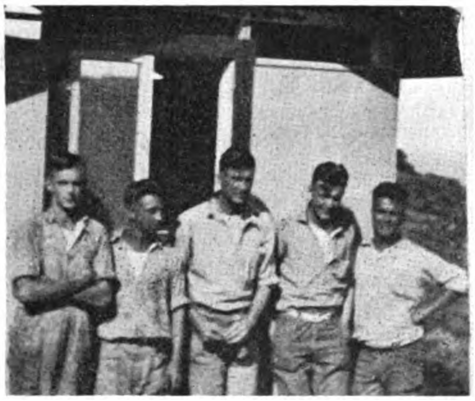
1. That no restrictions be placed on amateur transmitting stations communicating with other amateur stations. At present, an amateur is limited to communicate with only five other alloted stations.

2. That amateurs be permitted to transmit for an aggregate maximum of two hours in each twenty-four, limiting each transmission to ten minutes. This would invalidate the regulation requiring an amateur to transmit only during the two hours specified in his license.

3. That wave lengths for amateurs be reduced from the present 1,000 meters to about 400 meters and an experimental length of about 180 meters.

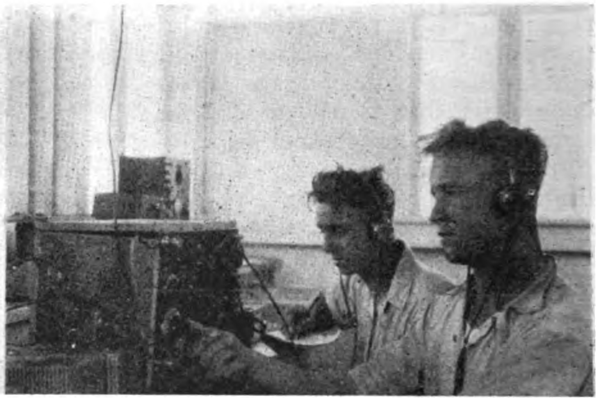
The last suggestion is due to complaints of the Air Ministry that aircraft traffic has been seriously interfered with by amateurs who have been allotted the general wave length of 1,000 meters.

The amateurs of the British Isles are, in general, still restricted to 10 watts input. Exception has been made, however, in the case of one or two participants in the recent Trans-Atlantic Amateur Transmissions, who have been authorized to use higher power in the Trans-Atlantic tests to be made next fall and winter.



Left to right: C. M. Hollar, R. S. Bruneau, T. A. Marshall, A. L. Newton, L. G. Davies

The shack where the receiving set was installed



R. S. Bruneau and L. G. Davies listening for Pacific Coast Amateurs

Pacific Coast Amateurs Heard in Hawaii

By R. S. Bruneau, (1 LAM)

OAHU, one of the islands in the Hawaiian group is, in my opinion and also the opinion of any "Op" who has tried to do any long distance work from there, one of the worst QRM vicinities in the world. NPM's big arc going practically all the time, with its harmonics, the broad-tuned spark of KHK to help draw the sweet forbidden words from our mouths, and about 'steen million smaller stations, make it anything but an ideal location for long-distance reception.

Besides this, we are on the wrong side of a large mountain range; the range being located between us and the west coast of the States, and to make matters worse we are right in one of those places known in radio circles as a "pocket." To be sure, mates, we have anything but good radio conditions here.

We are all head-over-heels with the advent of C.W. and the news has arrived of the good work done by Brother Dow (6ZAC) over on Maui, another island of this group and about 100 miles from us.

Being "bugs" of the first degree we couldn't sit still with the thought that even out here in "No Man's Land" our brothers on the Coast could be heard bawling each other out and trying to work the King of Siam and make a date with his daughter on a 5-watt tube. Therefore we resolved to have a finger in the pie to see how sweet it really did taste.

Friday morning, April 21, we gathered the gang for a hasty pow-wow and all sorts of suggestions were advanced. The idea of cutting a Culebra through the mountains to see if a few stray sigs would find their way through was looked upon as too much work, so we decided to borrow a truck and pack some gear to the other side of the rock and see what the outcome would be.

The start was made Saturday noon, April 22, with a Ford truck loaded with radio gear and chow (mostly chow). The gang consisted of T. A. Marshall, A. L. Newton, L. G. Davies, C. M. Hollar and R. S. Bruneau.

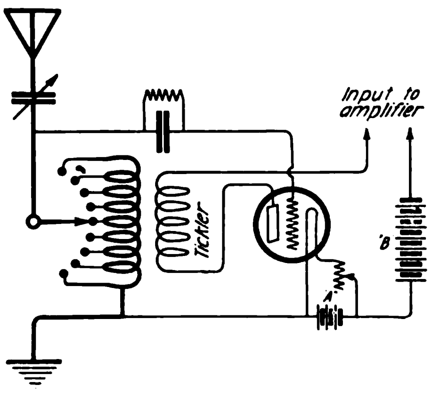
Makapuu Point had been decided upon as the best place for a test, it being the furthest away from the QRM center, which was about 40 miles. After much bumping and spilling of battery water over the chow we at last arrived at our destination.

The point is an ideal location for radio work, being about 700 feet above sea level. There are no trees or obstructions of any kind and the only buildings near were three houses where dwelt the lightkeepers and their families.

By dint of haste and hard work we had a portable field antenna of bamboo poles erected before dark. A wash house in the rear of the light-keepers' home was used as a shack to house the instruments. We then wired up our set which consisted of a honeycomb outfit, for long wave arc, and a short wave receiver, made by Mr. Marshall the afternoon before.

The short-wave receiver consisted of a Remler variocoupler, DeForest variable condensers (vernier type) and Western Electric phones. We used both Western Electric VT1's and UV200 Radiotrons.

To 6ZX goes the honor of being the first to be heard on this island, that station being logged at 7.32 p. m. on April 22. Next in order came 6KY at 7.40 p. m. We were bothered for a while by the harmonics from KIE. NPM'S big arc was heard most of the time, but did not bother us.



The hook-up used in the short-wave receiver at Oahu, H. T., for reception of Pacific Coast amateur signals

At 9.00 o'clock we put in a UV200 in place of a VT1 in the detector and 6KI calling 6ZZ came trickling through the phones at 9.02 p. m. From then on they came rolling in pretty steady. At 9.57 p. m. 6ZI was heard working 6ZAC and up to 10.30 p. m. telling 6ZAC to QRL. At 10.20 p. m. 6ZG calling 6ZAC with QRK? and QTC at 10.23 p. m. 6ZI then told 6ZAC to QRL if he wanted to get traffic through. 6ZI QSA at 11.17 p. m. calling 6ZAC. 6ZAC was very QSA at all times, as he is our next door neighbor over on Maui. At 12.26 a. m., April 23, 6ASJ called 6ASM with QRK? We then started to log a few messages as further proof of our claims and 6ZG helped us out.

At 1.22 a. m. 6NY heard, but QRZ. It was a pleasure to copy 6ZI and 6ZG as their operating ability was of the best. Since our trip 6ZI has been heard almost nightly, working 6ZAC. This was done from the side of the island farthest from the coast and with the mountain range between. On May 11 6ZI was working 6ZAC and sending double. 6ZAC replied with OK'S and "Go ahead single fast." So it seems safe to say that from now on amateur communication between here and the States is assured.

We are planning another trip about the 20th of May and expect to get even better results next time. Other trips from time to time have been planned. I am constructing a C.W. set now and am in hopes to have it finished by the time of our next trip.

Anyone wishing to try their luck with their transmitters can arrange a schedule with us by communicating with R. S. Bruneau, Submarine Base, Pearl Harbor, T. H.

New Bill to Regulate Radio Communication

Secretary of Commerce is Given Authority to Make, Alter and Revoke Regulations Applicable to All Licensed Stations

A NEW bill to regulate radio communication, known as S-3694, was introduced in the Senate on June 8, by Senator F. B. Kellogg, and after two readings was referred to the Committee on Interstate Commerce of the Senate. The same bill was introduced in the House by Representative White.

This new bill contains some radical changes as compared to the existing law of August 13, 1912. In the new bill the Secretary of Commerce is given authority to make, alter and revoke regulations applicable to all classes of licensed stations. He is also authorized to specify the area to be served by any station and the times and methods of operating any station or the apparatus therein.

Another new provision authorizes the Secretary of Commerce to refuse a license to any person, company or corporation which in his judgment "is monopolizing, or seeking to monopolize, radio communication, through the control of the manufacture, or sale, of radio apparatus, or by any other means."

An advisory committee is provided for, six members of which are to be designated by secretaries of government departments and six members of recognized attainment in radio communication, not otherwise employed in the government service, to be designated by the Secretary of Commerce.

Another section of the new bill provides that radio telephone stations, the signals of which can interfere with ship communication are required to keep a licensed radio operator of a class to be determined by the Secretary of Commerce, listening in on the wavelength designated for the distress signals during the entire period the transmitter of such station is in operation.

Amateur operation is specifically provided for in the new law. Wavelengths of not less than 150 meters, nor more than 275 meters, are assigned to amateur stations.

Another provision of the new law provides a schedule of fees to be collected both for station licenses, for operator's licenses, and for examination for such licenses.

The complete bill follows:

An Act to amend "An Act to regulate radio communication," approved August 13, 1912, and for other purposes.

Be it enacted by the Senate and the House of Representatives of the United States in Congress Assembled, that the Act of Congress entitled "An Act to Regulate Radio Communication," approved August 13, 1912, is amended by striking out sections one, two and three thereof and by inserting in lieu thereof the sections one, two and three following:

Section 1. A. No person, company or corporation within the jurisdiction of the United States shall use or operate any apparatus for radio communication by telegraphy or telephony as a means of intercourse among the several states or with foreign nations or upon any vessel of the United States engaged in interstate or foreign commerce, or for the transmission of radiograms or signals by telegraphy or telephony the effects of which extend beyond the jurisdiction of the state or territory in which the same are made or where interference would be caused thereby with the transmission or reception of messages or signals from beyond the jurisdiction of said state or territory, except under and in accordance with a license in that behalf granted by the Secretary of Commerce and except as hereinafter authorized.

B. The Secretary of Commerce from time to time shall:

a. classify licensed radio stations and the operators required therein;

b. prescribe the nature of the service to be rendered by each class of licensed station and assign bands of wave lengths thereto;

c. make, alter and revoke regulations, applicable to all licensed stations, not inconsistent with this Act or any other Act of Congress or with the terms of any radio communication convention to which the United States is a party, concerning the service to be rendered by each class of stations so established; the location of any station; the wave lengths to be used by any station; the kinds of instruments or apparatus in any station, with respect to the external effect produced thereby; the power and the purity and sharpness of the waves of each station or the apparatus therein; the area to be served by any station, and the times and methods of operating any station or the apparatus therein.

d. make such other regulations not inconsistent with law as he may deem necessary to prevent interference between all stations affected by this Act.

C. Radio stations belonging to and operated by the United States and used exclusively for communication of official business shall not be subject to the provisions of paragraphs A and B of this Section. Every other station owned and operated by the United States shall be subject to the provisions of said paragraphs A and B of this Section. All stations owned and operated by the United States and all other licensed stations on land or sea shall have special call letters designated by the Secretary of Commerce, and such stations and the designated call letters shall be included in the list of radio stations of the United States as published by the Department of Commerce. Radio stations owned and operated by the United States and used exclusively for the communication of official business shall use such wave lengths as shall be assigned to each by the President and shall observe such regulations as the Secretary of Commerce may make to prevent undue interference with other radio stations and the rights of others, except that upon proclamation by the President that there exists war or a threat of war or a state of public peril or disaster, or other emergency, the President may suspend for such time as he may see fit, all such regulations of the Secretary of Commerce applicable to such stations owned and operated by the United States.

D. Every such license shall provide that the President of the United States in time of war or public peril or disaster may cause the closing of any station for radio communication and the removal therefrom of all radio apparatus, or may authorize the use or control of any such station or apparatus by any department of the Government, upon just compensation to the owners.

Section 2. A. Paragraph A of Section 1 of this Act shall not apply to persons sending radio messages or signals through a Radio Station belonging to and operated by the United States for the transmission exclusively of official business nor to persons sending such messages on a foreign ship while the same is within the jurisdiction of the United States.

B. The station license required hereby shall not be granted to or after the granting thereof such license shall not in any manner, either voluntarily or involuntarily, be transferred to

a. Any alien or the representative of any alien;

b. Nor to any foreign government or the representative thereof;

c. Nor to any company, corporation, or association organized under the laws of any foreign government;

d. Nor to any company, corporation or association of which any officer or director is an alien or of which more than one-fifth of the capital stock having voting power is owned or controlled by aliens or their representatives or by a foreign government or representative thereof, or by any company, corporation or association organized under the laws of a foreign country.

Such station license, the wave length or lengths authorized to be used by the licensee and the rights therein granted shall not be transferred, assigned or in any manner, either voluntarily or involuntarily, disposed of to any other person, company or corporation without the consent in writing of the Secretary of Commerce.

C. The Secretary of Commerce, subject to the limitations of this Act, in his discretion, may grant to any applicant therefor, a station license provided for in sections 1 and 2 hereof, *except* that he may grant such license only to a station which is in the interest of the general public service.

No license granted by the Secretary shall be for a longer term than 10 years and any license granted may be revoked as hereinafter provided. Upon the expiration of any license, the Secretary in his discretion upon application therefor, may grant a renewal of such license for the same or for a lesser period of time.

The Secretary of Commerce is hereby authorized to refuse a license to any person, company or corporation, or any subsidiary thereof which, in the judgment of the Secretary, is monopolizing or seeking to monopolize Radio communication, directly or indirectly, through the control of the manufacture or sale of Radio apparatus or by any other means. The granting of a license shall not stop the United States from prosecuting such person, company or corporation for a violation of the law against monoplies or restraint of trade.

D. The Secretary of Commerce may grant licenses only upon written application therefor addressed to him, which application shall set forth such facts as he by regulation may prescribe as to the citizenship, character and financial, technical and other ability of the applicant to operate the station; the ownership and location of the proposed station and of the stations with which it is proposed to communicate; the wave lengths and the power desired to be used; the hours of the day or other periods of time during which it is proposed to operate the station; the purposes for which the station is to be used, and such other information as he may require. Such application shall be signed by the applicant under oath or affirmation.

E. Such station license as the Secretary of Commerce may grant shall be in such general form as he may prescribe but each license shall contain in addition to other provisions, a statement of the following conditions to which such license shall be subject:

a. The ownership or management of the station or apparatus therein shall not be transferred in violation of this Act. There shall be no vested property right in the license issued for such station or in the bands of wave length authorized to be used therein, and neither the license nor any right granted thereunder shall be assigned or otherwise transferred in violation of this Act.

b. Such licenses shall contain such other conditions, not inconsistent with this Act, as the Secretary of Commerce may prescribe.

F. Any station license granted by the Secretary of Commerce shall be revocable by him for failure to operate service substantially as proposed in the application and as set forth in the license. for violation of or failure to observe any of the restrictions and conditions of this Act or of any regulation of the Secretary of Commerce authorized by this Act or by the provisions of any international radio convention ratified or adhered to by the United States or any regulations thereunder or whenever the Secretary of Commerce shall deem such revocation to be in the public interest; provided, that no order of revocation shall take effect until 30 days' notice in writing thereof to the parties known by the Secretary to be interested in such license. Any person interested, aggrieved by said order, may make written application to the Secretary at any time within said 30 days, for a hearing upon such order and upon filing of such written application said order of revocation shall stand suspended until the conclusion of the hearing herein directed. Notice in writing of said hearing shall be given by the Secretary to all the parties known to him to be interested in such license, 30 days prior to the time of said hearing. Said hearing shall be conducted under such rules and in such manner as the Secretary may prescribe. Upon the conclusion thereof, the Secretary may affirm, modify or revoke said orders of revocation.

Section 3. A. The actual operation of apparatus in any radio station for which a station license is required by this Act shall be carried on only by a person holding an operator's license issued thereunder. No person shall operate any apparatus in such station except under and in accordance with an operator's license issued to him by the Secretary of Commerce.

B. The Secretary of Commerce, in his discretion, may grant special temporary operators' licenses to operators of radio apparatus under such regulations, in such form and upon such conditions as he may prescribe whenever an emergency arises requiring prompt employment of such an operator.

C. An operator's license shall be issued by the Secretary of Commerce in response to a written application therefor, addressed to him, which shall set forth:

a. The name, age and address of the applicant;

b. The date and place of birth;

c. The country of which he is a citizen, and if a naturalized citizen of the United States, the date and place of naturalization;

d. The previous experience of the applicant in operating radio apparatus; and

e. Such other facts or information as may be required by the Secretary of Commerce.

Every application shall be signed by the applicant under oath or affirmation.

D. An operator's license shall be issued only to a person who, in the judgment of the Secretary of Commerce, is proficient in the use and operation of radio apparatus and in the transmission and reception of radiograms by telegraphy and telephony. Except in an emergency found by the Secretary of Commerce to exist, an operator's license shall not be granted to any alien, nor shall such a license be granted to a representative of a foreign government.

E. An operator's license shall be in such form as the Secretary of Commerce shall prescribe, and may be suspended by him for a period not exceeding two years upon proof sufficient to satisfy him that the licensee

a. has violated any provision of any act or treaty which the Secretary of Commerce is authorized by this Act to administer, or of any regulation made by the Secretary under any such act or treaty; or

b. has failed to compel compliance therewith by any unlicensed person under his supervision; or

c. has failed to carry out the lawful orders of the master of the vessel on which he is employed; or

d. has wilfully damaged or permitted apparatus to be damaged; or

e. has transmitted superfluous signals, or signals containing profane or obscene words or language.

F. A license may be revoked by the Secretary of Commerce upon proof sufficient to satisfy him that the licensee was at the date his license was granted to him, or is at the time of revocation, ineligible for a license.

Section 4. A. After the approval of this Act the construction of a station for which a license is required by this Act shall not be begun, nor shall the construction of a station already begun be continued, until after a permit for its construction has been granted by the Secretary of Commerce upon written application therefor. This application shall set forth such facts as the Secretary of Commerce by regulation may prescribe as to the citizenship, character and the financial, technical and other ability of the applicant to construct and operate the station, the ownership and location of the proposed station and of the station or stations with which it is proposed to communicate, the wave length or wave lengths desired to be used, the hours of the day or other periods of time during which it is proposed to operate the station, the purpose for which the station is to be used, the type of transmitting apparatus to be used, the power to be used, the date upon which the station is expected to be completed and in operation and such other information as the Secretary of Commerce may require. Such application shall be signed by the applicant under oath or affirmation.

B. Such permit for construction shall show specifically the earliest and latest dates between which the actual operation of such station is expected to begin and shall provide that said permit will be automatically forfeited if the station is not ready for operation within the time specified. The rights granted under any such permit shall not be assigned or otherwise transferred to any other person, persons, company or corporation, without the approval of the Secretary of Commerce; Provided, that a permit for construction shall not be required for Government stations to be used exclusively for communication of official business or for private stations as provided for in Section 4, fifteenth regulation of the Act of August 13, 1912. The granting of this permit to construct a station as herein required shall not be construed to impose any duty or obligation upon the Secretary to issue a license for the operation of such station.

Section 5. An advisory committee is hereby established to whom the Secretary of Commerce shall refer for examination and report such matters as he may deem proper relating to

a. The administration or changes in the laws, regulations, and treaties of the United States relating to radio communication.

b. The study of the scientific problems involved in radio communication with the view of furthering its development.

c. The scientific progress in radio communication and the use of radio communication;

The advisory committee shall consist of twelve members of whom one shall be designated by the Secretary of State, one by the Secretary of War, one by the Secretary of the Navy, one by the Secretary of Agriculture, one by the Postmaster General, and one by the Secretary of Commerce to represent these Departments respectively, and six members of recognized attainment in radio communication not otherwise employed in the Government Service to be designated by the Secretary of Commerce.

The necessary expenses of the members of the committee in going to, returning from, and while attending meetings of the committee, including clerical expenses and supplies, together with a per diem of twenty-five dollars to each of the six members not otherwise employed in the Government Service for attendance at the meetings, shall be paid from the appropriations made to the Department of Commerce for this purpose.

Section 6. Radio telephone stations, the signals of which can interfere with ship communication, are required to keep a licensed radio operator of a class to be determined by the Secretary of Commerce, listening in on the wave length designated for distress signals, during the entire period the transmitter of such station is in operation.

Section 7. Regulation First of Section 4 of said Act of Congress, approved August 13, 1912, is amended by striking out the words, "this wave length shall not exceed 600 meters or it shall exceed 1,600 meters."

Regulation Second of Section 4 of said Act of Congress, approved August 13, 1912 is amended by striking out the words "provided that they do not exceed 600 meters or that they do exceed 1,600 meters."

Regulations Third and Fourth of Section 4 of said Act of Congress, approved August 13, 1912, are hereby repealed.

Regulations Fifteen and Sixteen of Section 4 of said Act of Congress, approved August 13, 1912, are amended by striking out the words "exceeding 200 meters," and substituting in lieu thereof the words "of not less than 150 meters nor more than 275 meters."

Section 8. Any person, company or corporation who shall erect, use or operate any apparatus for radio communication in violation of this act, or knowingly aid or abet another person, company or corporation in so doing, or knowingly make any false oath or affirmation for the purpose of securing a permit or a license, shall incur a penalty not to exceed one thousand dollars which may be mitigated or remitted by the Secretary of Commerce; and the permit or license of any person, company or corporation who shall violate any of the provisions of this Act, or of any of the Regulations of the Secretary of Commerce issued hereunder, or knowingly make any false oath or affirmation for the purpose of securing a permit or license, may be suspended or revoked by the Secretary of Commerce.

Section 9. The Secretary of Commerce is hereby authorized and directed to charge and through the imposition of stamp taxes on applications, licenses or other documents, or in other appropriate manner, to collect the fees specified in the schedule following. The Secretary shall collect said fees through the Collectors of Customs or other officers designated by him and he may make such regulations as may be necessary to carry out the provisions of this section;

SCHEDULE OF FEES TO BE COLLECTED

	Per annum
For transoceanic radio station license	$300.00
For commercial land station license, other than transoceanic, one kilowatt transmitter input or less	50.00
and for each additional kilowatt or fraction thereof	5.00
For ship station license	25.00
For experiment station license	25.00
For technical and training school station license	15.00
For special amateur station license	10.00
For general and restricted amateur station license	2.50
For commercial extra first-class operator's license	2.50
For commercial first-class operator's license	1.50
For commercial second-class operator's license	1.00
For commercial cargo grade operator's license	.50
For experiment and instruction grade operator's license	1.00
For amateur first grade operator's license	.50
For amateur second grade operator's license	.50
	For each examination
For commercial extra first-class radio operator's examination for license	2.50
For commercial first-class radio operator's examination for license	2.00
For commercial second-class radio operator's examination for license	1.50
For commercial cargo grade radio operator's examination for license	1.00
For experiment and instruction grade radio operator's examination for license	1.00
For amateur first grade radio operator's examination for license	1.00
For amateur second grade radio operator's examination for license	.50

In the event that other classes of station and operator's licenses or other examinations shall hereafter be prescribed in any lawful manner, the Secretary of Commerce is hereby authorized and directed to charge and collect in the same manner as herein provided, fees for such new classes of licenses and of examination which fees shall be substantially of the amount herein specified for the license and examination nearest in character and purpose of the new license or examination so prescribed.

For failure to pay at the time and in the manner specified by the Secretary of Commerce any of the above fees, the Secretary of Commerce is authorized to refuse to issue such licenses or if issued to suspend or revoke the same as he may deem proper.

Section 10. Wherever the words "Naval and Military" stations appear in the Act to regulate Radio Communication, approved August 13, 1912, said words "Naval and Military" shall be stricken out and the word "Government" substituted in place thereof.

Section 11. All Acts or parts of Acts in conflict with this Act are hereby repealed.

The Monthly Service Bulletin of the

NATIONAL AMATEUR WIRELESS ASSOCIATION

Guglielmo Marconi
President

J. Andrew White
Acting President

H. L. Welker
Secretary

Founded to promote the best interest of radio communication among wireless amateurs in America

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HEADQUARTERS: 326 BROADWAY, NEW YORK

THE regular bi-monthly meeting of the New Haven Radio Association at the club rooms in Fraternal Hall in Elm Street on May 18, was one of the largest attended and most enthusiastic held this year. The main feature of the evening's program was the award of prizes in the construction of a receiving set and the membership drive.

Clarence E. Palmer, of 66 Marne Street, Hamden, who brought in a beautiful cabinet tube regenerative set, was declared the winner of the tube regenerative set competition. The prize was a year's supporting membership in the association, valued at $6. Wilbur Sheld, of 220 Dwight Street, was accorded honorable mention in this contest.

F. Donato of 882 Howard avenue, who brought in a small crystal set accompanied by a diagram of its wiring, received the prize for the school-boy's class which also was a year's supporting membership in the club.

The membership contest in which 14 took part was won by Frederick Brill of 242 Davenport avenue, who received a detector tube.

The club now has a membership of about 150 and is growing stronger at each meeting.

W. A. Rida, vice-president of the association, resigned last night because of other pressing duties. He will be succeeded by Stallo Martino, who has already given much of his time in the interests of the club.

Following the business session of the meeting, Seabury B. Waring of Yale University, a true radio comedian, delighted the club with his imitations of an amateur operator.

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THE city government of Newark, N. J., will regulate wireless installations if a measure introduced recently by Director of Public Safety Brennan is adopted by the City Commissioners.

Mr. Brennan's measure provides that persons desiring to put up wireless sets must first obtain permits and then use specified safety devices. It also provides for inspectors to examine the apparatus after it is set up.

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A SURVEY of all radio transmitting stations licensed by the department of commerce shows that on May 31 there were 19,067 stations. Of this number 15,495 are amateur stations, 348 experimental American ships, and the balance, 439, commercial stations.

Of this last number, there are today 274 broadcasting stations, known as limited commercial stations, twenty of which were licensed this week. They comprise universities, municipalities, newspapers, electrical manufacturers and retail stores, sending entertainment or information on weather, crops and market reports.

The growth of this class of radio stations has been remarkable; it jumped from sixty-seven stations a little more than two months ago to 274 to date. Applications are filed on an average of about three or four a day.

Transmitting Stations

Transoceanic	11
General public or "ship to shore"	31
Point to point	124
Broadcasting	274
American ships	2,783
Experimental	225
Technical and training schools	123
Amateur	15,294
Special amateur	201
Total	19,067

Amateur Stations by Districts

1. Boston	2,490
2. New York	2,313
3. Baltimore	1,831
4. Baltimore (Savannah)	319
5. New Orleans	699
6. San Francisco	1,616
7. Seattle	726
8. Detroit	2,393
9. Chicago	2,907
Total	15,294

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A PUBLIC meeting of the Detroit Radio Association was held in The Detroit News conference room recently. "How to Construct an Aerial," "How to Build Simple Receiving Sets," and "Explanation of Wave Lengths" were discussed.

During the general meeting questions on radio matters were answered by members of the association, and the subject of forming a new radio club to be known as the Detroit Amateur Radio Club was discussed.

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INCORPORATION papers have been taken out by the American Radio Association, organized by Chicagoans, with headquarters in the Loop building, Clark, near Madison street. The object of the association, according to incorporation articles filed with the Secretary of State, is to "further scientific, commercial and social interests of radio by combining into a harmonious and active organization."

The association also announces its intention to co-operate with the department of commerce and other governmental, municipal and official authorities in "regulating and enforcing ether rights." Protection of buyers from fraudulent dealers also is planned.

The organization will maintain an engineering staff for the benefit of its members. Plans are being made to make the organization national.

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AMATEUR radio transmitting stations operating on 200 meters are at liberty to use the ether at all times, except between 7:30 and 9 o'clock at night, according to a decision made by Major M. J. Dillon, United States radio inspector for the 6th Radio District.

If the owners of receiving sets will make a thorough examination of their machines, Major Dillon says, he believes that the "listening in" fans will find that their trouble rests with improper tuning, and not from the interference of amateurs.

Amateur operators must of necessity be allowed their scheduled time on the air, he said. And just so long as they continue operating on 200 meters, he said, there wasn't anything his office could do by way of checking their activity.

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THOMAS FINNEGAN, thirty-seven years old, of No. 890 Tinton avenue, the Bronx, New York City, lost the thumb of his left hand and received lacerations of his right hand, when a large calibre cartridge he was filing exploded. He was taken to Lincoln Hospital. Finnegan, who is a radio man, recently found the cartridge and decided to use the brass tube in connection with his receiving set. He was filing off the head of the cartridge when he struck the percussion cap.

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IN the first contest of its kind, the University of Minnesota defeated the University of Wisconsin in a game of chess by radio on May 5. Three men were to have played on each side in three games, but two of the Wisconsin contestants failed to appear at the broadcasting rooms in Madison and only one game was played. Joseph M. Jran, who played that game from the radio rooms at the University of Minnesota, won in 19 moves.

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THE National Board of Fire Underwriters has formulated a set of rules governing the installation of wireless receiving sets that are connected with outdoor antennae.

These rules aid to minimize to a great extent the lightning danger and fire hazard generally believed to be associated with outdoor attennae.

The rules in detail follow:

"(a) Antennae outside of buildings shall not cross over or under electric light or power wires of any circuit carrying current of more than 600 volts, or railway trolley or feeder wires, nor shall it be so located that a failure of either antenna or of the above mentioned electric light or power wires can result in a contact between the antenna and such electric light or power wires.

"Antenna shall be constructed and installed in a strong and durable manner and shall be so located as to prevent accidental contact with light and power wires by sagging or swinging.

"Splices and joints in the antenna span, unless made with approved clamps or splicing devices, shall be soldered.

"Antenna installed inside the building are not covered by the above specifications.

"(b) Lead-in wires shall be of copper, approved copper-clad steel or other approved metal which will not corrode excessively, and in no case shall they be smaller than No. 14 B. & S. gauge except that approved capper-clad steel not less than No. 17 B. & S. gauge may be used.

"Lead-in wires on the outside of buildings shall not come nearer than four (4) inches to electric light and power wires unless separated therefrom by a continuous and firmly fixed non-conductor that will maintain permanent separation. The non-conductor shall be in addition to any insulation on the wire.

"Lead-in wires shall enter building through a non-combustible, non-absorptive insulating bushing.

"(c) Each lead-in wire shall be provided with an approved protective device properly connected and located (inside or outside the building) as near as practicable to the point where the wire enters the building. The protector shall not be placed in the immediate vicinity of easily ignitable stuff, or where exposed to inflammable gases or dust or flyings of combustible materials.

"The use of an antenna grounding approved lightning arrester which will operate at a potential of 500 volts or less.

"The use of antenna grounding switch is desirable, but does not obviate the necessity for the approved protective device required in this section. The antenna grounding switch, if installed, shall, in its closed position, form a shunt around the protective device.

"(d) The ground wire may be bare or insulated and shall be of copper or approved copper-clad steel. If of copper the ground wire shall be not smaller than No. 14 B. & S. gauge, and if approved copper-clad steel it shall not be smaller than No. 17 B. & S. gauge. The ground wire shall be run in as straight a line as possible to a good permanent ground. Preference shall be given to water piping. Gas piping shall not be used for grounding protective devices. Other permissible grounds are grounded steel frames of buildings or other grounded metallic work in the building and artificial grounds such as driven pipes, plates, cones, etc.

"The ground wire shall be protected against mechanical injury. An approved ground clamp shall be used wherever the ground wire is connected to pipes or piping.

"(e) Wires inside buildings shall be securely fastened in a workmanlike manner and shall not come nearer than two (2) inches to any electric light or power wire unless separated therefrom by some continuous and firmly fixed non-conductor making a permanent separation. This non-conductor shall be in addition to any regular insulation on the wire. Porcelain tubing may be used or incasing wires to comply with this rule.

"(f) The ground conductor may be run inside or outside of building. When receiving equipment ground wire is run in full compliance with rules for protective ground wire, in Section d, it may be used as the ground conductor for the protective device."

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THE elimination of the short-wave "mush" of several high-power naval arc stations by means of a new method, has brought joy to the hearts of many thousands of amateur operators.

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A LECTURE under the auspices of the Program Committee of the Milwaukee Amateurs' Radio Club, "Straight C.W., Radio Regeneration and Amplification" by Mr. L. S. Hansen, A.M.I.R.E., Howard Radio Company, Chicago, Ill., was given on Monday, May 22, 1922, in the Trustees' Room of the Milwaukee Public Museum.

Kadel & Herbert

Prof. J. A. Fleming, F.R.S., lecturing on radio telephony before an audience of children

HARRY CONRAD, sixteen years old, of No. 2096 Amsterdam avenue and Paul John, eighteen years old, of No. 230 West One Hundred and Seventh street, two high school boys charged with burglary after forcing an entrance into the De Forest Radio Telephone and Telegraph Company plant at No. 1391 Sedgewick avenue, the Bronx, were discharged by Magistrate Sweetzer in Morrisania Court at the request of Richard Keaton, manager of the plant. Mr. Keaton said that in view of the fact that nothing had been taken from the place he did not wish to hurt the boys' careers and that he believed their act was more the result of a boyish prank than an intent to commit a crime.

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AT the annual meeting of the Tech Radio Club, of the Brooklyn Polytechnic Institute, held recently, the following new officers were elected for the ensuing year: Ole Engstrom, president; F. Andre, secretary and treasurer, and Brainard Foote, as third member of the board of directors.

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ANNOUNCEMENT was made by Judges J. Andrew White, H. Gernsback, L. Cockaday and Miller Reese Hutchison, of the awards made in the amateur radio receiving set contest held at the Radio Show at the 71st Regiment Armory; the awards were as follows: 1st Prize, $100, Rudolph Knopp, Cedar Grove, N. J.; 2nd Prize, $75, A. Faske, 1515 Eastern Parkway, Brooklyn; 3rd Prize, $50, F. B. & Walter Ostman, 180 Broad street, Ridgewood, N. J.; 4th Prize, $25, William A. Irvin, 319 Monroe St., Brooklyn. The following were each awarded a ten-dollar prize for their sets: Adam Dashiell, Albert W. Beiler, Gilbert H. Meyer, Peter Till, Jerome R. Childs, Allan Edwards, Edward Pina, Henry Farkough, and W. A. Robins. Five-dollar prizes were allotted to the following: Charles Ballette, Arthur Schoy, Jos. E. Knipper, Victor Kern, William H. Ruf (who had eight diminutive sets entered, and who refused an offer of $1,000 from Jeanne Eagles for his patented finger ring radio set) and Henry Farkough, who in addition to winning a ten-dollar prize, won two five-dollar prizes with two very ingenious tiny sets.

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"RADIO DAY" is the name given by the Radio Engineering Society of Pittsburgh to a day set aside each year for an outing of the radio fans of Pittsburgh and vicinity. The idea originated with the above society when it held the first "Radio Day" in Pittsburgh on August 17th, 1919, attended by a small group of radio enthusiasts. The annual radio outing of the Society has since been a regular event each year and has met with widespread popular approval. From a small group of "Old Timers" in the amateur fraternity of this locality who attended the first modest gathering, the attendance at these annual outings of the Radio Engineering Society each succeeding year has grown to such proportions that it was deemed necessary by the Society to arrange for the exclusive use of a large amusement park this season to accommodate the crowds it is confidently expected will turn out for the occasion.

The Committee in charge of the affair is composed of the following officers and members of the Radio Engineering Society: W. K. Thomas, Chairman; C. E. Urban, Secretary; M. Hirsch, Treasurer; Dr. Omar T. Cruikshank, Guy Davis, W. E. Menges, John B. Coleman, C. C. Young, John Schaming and Thomas McLean.

Pittsburgh's "Radio Day" will be held August 24, 1922, at Westview Park, which is ideally situated and adapted for the purpose. A program of events is being planned that is full of novelty, pep and entertainment. Many new and interesting radio contests are being scheduled with prizes for the winners that will cause a scramble of applicants to participate. The prizes will be donated by the various local radio dealers and manufacturers who will stage an exhibition of the latest developments in radio appliances covering three hundred square feet of space in two large Exhibition Halls on the grounds. Some of the dealers have started a movement to have all radio stores in the Pittsburgh district close on the day of the outing, and will insert placards in their windows bearing the inscription:

"*This Store Will Close August 24th*
"RADIO DAY"
Meet Us in Westview Park

The park is but a short ride from the city and has many amusement features such as a roller-coaster, dip-the-dips, lake rowing, pony riding, merry-go-round, curiosity house, moving picture theatre and other attractions. Dancing will take place afternoon and evening at a large dancing pavilion. While a first-class dance orchestra will be provided, it is also planned to dance certain numbers to radiophone music transmitted by local broadcasting stations and received on apparatus equipped with multi-stage amplifiers and loud-speakers.

Meals will be provided, table d'hote or a la carte, at popular prices, in the park dining room which is spacious and well equipped. There is also a picnic grove for those desiring to bring basket lunches.

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THE station of the First Wing, Air Service, U. S. A. at Kelly Field, San Antonio, Texas, calls letters 5XI, is equipped with a 1 kw. spark set which works on 340 meters. The cage type antenna, 60 feet high, 120 feet long is used.

The official call of this station is DM4 and works with other Government stations using voice and I.C.W. on 840 meters and 1,200 meters. Continuous wave communication is also carried on, on 1,200 and 1,700 meters. Lt. Max F. Schneider the Wing Communications radio officer is in charge of the station.

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THE United States Civil Service Commission announces open competitive examinations for junior engineer on July 5 and August 23, 1922 to fill vacancies in the Bureau of Standards, Department of Commerce, Washington, D. C. or elsewhere, at $1,200 and $1,500 a year, with a possible additional allowance of $20.00 a month.

Applicants may apply to the Civil Service Commission, Washington, D. C. for application blanks and for further information in connection with these examinations.

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THE Argentine Republic, in South America, has authorized transmission by amateurs. Permission for transmitting is easily obtained from the Government. As the regulations stand at present, amateurs are allowed a wavelength not in excess of 300 meters and the power is limited to 50 watts.

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AN examination for the position of Radio Inspector is to be held July 19 by the U. S. Civil Service Commission, in order to fill vacancies in the Bureau of Navigation, Department of Commerce, at $1,800 to $2,200 a year. Other vacancies may be filled from the ranks of successful candidates, including positions as Assistant Radio Inspector. Candidates are required to be operators, have either a college or a high school education, and at least two years' experience in special radio work.

The U. S. Civil Service Commission is to hold in the near future an examination for the position of Assistant Radio Engineer in the office of the Chief of Air Service, Washington, D. C., at $2,400 a year. Applications are being received up until July 11. Applicants must have had considerable experience in radio design, installation, operation and research, and are required to submit a thesis or an original publication.

An examination for the position of Radio Operator is to be held by the U. S. Civil Service Commission on some date after July 18, when applications close. The examination is for the purpose of filling vacancies at $960 a year in the Lighthouse Service at various points on both coasts and in Honolulu. Applicants must have had a common school education and at least two year's experience as a commercial operator.

- CORRESPONDENCE -

Amateur Radio Operation in England

37 Bishop's Road,
Highgate, London, N. C., May 14, 1922

The Editor of THE WIRELESS AGE, N. Y.

Dear Sir:

I was extremely interested in Mr. Godley's article, in your last number, on British Radio. However there are one or two points I should like to mention. With reference to our societies which Mr. Godley visited. Altho' the Wireless Society of London is theoretically an amateur society it is really an "experts" club. The real amateur clubs are to be found round in the suburbs of London and in the provinces. Here Mr. Godley would find youth and keen interest to compare with any American Association. There are very few true amateurs in the Wireless Society of London or, for that, in the Royal Society Arts. It was a great pity Mr. Godley could not visit some of these clubs from both sides.

With reference to our receivers, a man over here who buys a complete set, is as a general rule, classed as a fool with plenty of money. Whereas in the States a man buys his Paragon or Grebe set, the true "DX" man over here makes his own, with the result that our receiving ranges are greater than those in U. S. A. despite our tiny aerials. I am not going to reopen the question of the Trans-Atlantics and aerials, but I should like to mention a few of our ranges here. First, as for wavelengths, we used 1,000 meters, rather than 180 meters, as we found that greater ranges were obtained in practice and more reliable communication established. All the time we knew a wave of say 300-400 meters would be better, but we could not have it. Now we have 150 to 200 meters and 440 meters allowed us. However, there are stations working on 350 meters and a few ranges we get may make some people sit up and take notice. We are able to carry on regular C.W. traffic over 470 miles with 10 watts input on 350 meters, and usually voice communication is possible, too. This reception is accomplished with no H.F. amplification. On several occasions this distance has been covered by I.C.W. with 90 milliamperes in the aerial circuit, i.e., about a couple of watts. Conversations over 100 miles in daylight often take place on 1,000 meters, and our latest record is speech over 84 miles with 28 watts input, 280 milliwatts! Over here an amateur transmitter is not much to notice unless it has a regular range of 100 miles speech and 200 miles C.W. in daylight at 10 watts input. To give an example of what every one does over here, there is the concert weekly, on Sunday afternoon, from PCGG at The Hague, Holland, 250 miles from London, on 1,050 meters, 200 watts. Almost every one gets this O.K. on one valve and some even get it on a crystal. It is quite easy, too, to get it on two valves with no aerial, on a decent British amateur set. There is food for thought here for some American hams who seem to want about umpteen kilowatts. Another point is this. During the last eighteen months I have logged about 110 amateur stations. Of these four used spark and two of them usually use phone or C.W. Over here, saying that a man has a transmitter means that he has a 'phone—spark has gone forever.

Yours truly,
FREDERIC L. HOGG,
Radio 2SH

Prize Contest Announcement

The subject for the new prize contest of our year-round series is:

WHAT HAVE YOU DONE TO ELIMINATE STATIC

CLOSING DATE :: :: AUGUST 1, 1922

Contestants are requested to submit articles at the earliest practical date.

Prize winning articles will appear in the October, 1922, issue.

All manuscripts should be addressed to the CONTEST EDITOR OF THE WIRELESS AGE.

This season will no doubt bring out many improved methods among amateur experimenters for the elimination of static on the broadcasting wavelengths.

Everybody is complaining about the QRN and many inquiries have reached this office as to what methods should be employed to eliminate it to the greatest extent.

PRIZES will be awarded for the best replies.

PRIZE CONTEST CONDITIONS—Manuscripts on the subject announced above are judged by the Editors of THE WIRELESS AGE from the viewpoint of the ingeniousness of the idea presented, its practicability and general utility, originality and clearness in description. Literary ability is not needed, but neatness in manuscript and drawing is taken into account. Finished drawings are not required, sketches will do. Contest is open to everybody. The closing date is given in the above announcement. THE WIRELESS AGE will award the following prizes: First Prize, $10.00; Second Prize, $5.00; Third Prize, $3.00, *in addition to the regular space rate paid for technical articles.*

STATIONS WORKED AND HEARD

Stations worked should be enclosed in brackets. All monthly lists of distant stations worked and heard which are received by the 10th of each month will be published in the next month's issue. For example, lists received by November 10th will be published in the December issue. Spark and C. W. stations should be arranged in separate groups.

6ZF, W. W. LINDSAY, Jr., Los Angeles, Cal. (March)

CW—4bq, 4ft, 4gl, 4zc, 4cb Can., (5za), (7qe), (7xf), (7xg), (cl8), 8jl, 8vy, 8wi, 8xv, 8zg, 8agz, 8axk, 8brl, 9fm, 9pi, 9ps, (9wd), (9wu), (9xi), 9xm, 9bd Can,, 9aav, 9arq, 9aja, 9ayu, 9bji, 9dng, 9dth, 9dtm, (9dva), 9egm, 9xaq, 9zac, (9zaf).

Spark—5ak, 5er, 5if, (5xd), 5yq, (7bk), 7ck, (7ge), (7gj), (7il), 7jd 425 meters, (7ke), (7ik), (7ly), (7mf), (7mp), 7nw, (7oh), (7ot), (7oz), (7po), (7vo), (7wg), 7xb, 7ya, (7yl), (7zj), (7zm), (7zp), (7zt), (ci8), 9zj.

8HJ, Joel J. Young, Elmira, N. Y. (April and May) (Detector only.)

Spark—(1ayz), (1bbw), (1bes), 1bqk, (1bwj), (1chj), (1cik), 1cja, (1csa), 1jt, (1pm), (1pr), (1vq), 1yb, 1xz; (2aeq), 2agc, 2aif, (2ayv), (2bbx), (2beh), (2bem), 2bfx, (2bfz), (2bgi), (2bnd), (2bqd), (2brc), 2bua, (2fz), (2hw), 2lh, (2rd), (2wt), 2cen, 2cft, 2cjn; 3any, (3bij), (3bnu), (3buv), 3fm, (3fp), (3fr), (3gh), (3il), (3iw), (3nh), (3qv), (3zo); 4gh, 4gx, 4iv; 6cu, 6ka, 6xad; (9aiy), (9amo), 9amt, (9ane), (9aog), 9arz, 9awm, (9axf), 9bed, (9bfg), (9blc), 9bhd, 9bsg, 9bya, (9bzo), (9dax), (9ddz), (9dgq), 9dio, 9dky, 9dqq, (9dsw), 9dzq, 9ei, (9ii), (9qf), (9uc), 9uu, (9wq), 9wu, Canadians, C.W.—3dq, (3cz), (3ji).

8AUX—G. Z. Jackson, Cleveland, Ohio (May)

Cleveland, Ohio (May)—1aj, 1aw, 1rh, 1xz, 1adc, 1adl, (1arb), 1ary, (1boq), 1bua, 2bm, 2el, (2fp), (2om), 2rm, 2wb, 2acd, 2ahu, 2ahw, 2aje, (2arb), 2beh, 2cdz, 3ac, 3ba, 3bp, 3cc, 3ez, 3fp, 3gx, (3uc), 3zo, 3zy, 3arb, 3ajd, 3aln, 3aov, (3bij), 3bsh, (3bfu), 3blf, (4cx), 4ea, (4fd), 4gl, 4gn, 5da, (5hk), 5py, 5xa, 8bo, 8dy, (8eb), (8eo), (8ew), (8ft), 8fv, 8ky, (8lb), (8lf), (8mz), (8no), 8oc, (8rt), (8sp), 8ty, 8ue, (8uo), (8vq), 8vy, (8uc), (8wd), (8yn), 8ze, (8zo), (8afd), 8afe, (8ahq), (8ajw), 8ago, (8ajx), (8akq), (8amz), (8ano), 8aoi, 8aqo, (8ars), 8asl, 8awu, 8ayc, 8aym, 8azf, 8bcf, (8bbu), (8cgz), 8ceb, (9cp), 9fp, (9ki), 9kx, (9lf), 9mc, 9ox, (9pd), 9rc, 9sn, (9uh), (9uu), (9vl), (9yb), (9yj), 9zc, 9zn, 9aau, (9aaw), 9acb, 9afk, (9agr), 9aiu, 9air, 9ark, 9avv, 9awz, (9aze), (azf), 9bhd, 9biq, (9dcx), 9den, (9dfx), (9dlx), (9dkk), (9drr), (9dzy).

9CCW, C. W. Scott and Stewart M. Scott, 6026-A Washington Ave., St. Louis, Mo., (April)

CW—1ru, 1afv, 1ary, 1cak, 2fd, 2ft, 2zl, 2zz, 3iw, 3mo, 4bq, 4ss, 4zc, 4ft, 5ho, 5la, 5rz, 5xb, 8bk, 8ci, 8ge, 8hm, 8hp, 8wr, 8xe, 8abv, 8aeg, 8aio, 8ale, 8aqf, 8aot, 8awp, 8bci, 8bfx, 8bow, 8box, 8zae, 9el, 9io, 9kp, 9lq, 9wt, 9yb, 9bed, 9dcr, 9aw, Can. 3bp.

Spark—1aw, 1sn, 1awz, 3el, 3ms, 4gn, 4jb, 5aa, 5by, 5eg, 5ek, 5is, 5ms, 5py, 5uu, 5zab, 5zak, 8bp, 8cp, 8dw, 8ew, 8fn, 8go, 8jj, 8lh, 8lj, 8mr, 8po, 8qq, 8ru, 8tk, 8tt, 8yn, 8zp, 8acf, 8acr, 8acn, 8afb, 8afd, 8aff, 8afk, 8ago, 8ahh, 8aib, 8ajx, 8amo, 8amz, 8ano, 8ard, 8ars, 8atu, 8awp, 8ayn, 8bbu, 8bep, 8bna, 8brl, 8bun, 8dbo, 8zaa, 9ap, 9au, 9be, 9bf, 9bp, 9ca, 9cp, 9cs, 9ee, 9el, 9et, 9fk, 9fs, (9ko), 9ky, 9lf, 9lw, 9me, 9ms, 9nq, 9ox, 9ps, 9rc, 9ll, 9uh, 9uu, 9vm, 9vw, 9xi, 9yb, 9yc, 9yo, 9aau, 9aap, 9aey, 9aff, 9auh, 9bbu, 9bcx, 9bdf, 9bij, 9blg, (9cee), 9deu, 9ded, 9dzu, 9tty, 9wt, 9yak.

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Model 301

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27 Weston Avenue, Waverly Park, Newark, N. J.
Branch Offices in all Principal Cities

Radio Ramblings

The melancholy days have come
The saddest of the year
So sang our friend the poet once
But now he's wrong I fear.

The summer static's over and
The air is clear and bright
There's always something doing tho'
I listen every night.

On Saturdays a football game
Will find me full of pep
Tho' far away from scenes of strife
It seems but just a step.

When winter comes and piles of snow
Are heaped about my door
On Sunday morn why freeze my toes?
I'll venture out no more.

For in my humble cottage is
A simple wireless set
I'll hear the choir singing and
Perhaps a sermonette.

It has one great advantage if
The sermon fails to suit
I'll cut the preacher off real short
And practice on my flute.

Now after all is said and done
There's just this much about it
Take my advice and get a set
No home's complete without it.

—Peter Deets.

✦ ✦ ✦

A Problem Solved

By Static Sam

Every time I have a radio problem, some smart fellow comes along and solves it for me and takes some of my money.

I had one connection on my set for phones. Had two pair hooked up in series. That was OK when I wanted 'em both in operation. When I didn't, had to un-hook a pair. Lots of trouble. Then along comes the Multijack (Pacent). I bit!

Now I can have one pair or two or three in operation. Hot dog—no more trouble. What's next?

Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of one reader can be answered in the same issue. To receive attention these rules must be rigidly observed.

Positively no questions answered by mail.

C. L. B., Vermont, Ill.

Q. 1. Which is the more efficient; a three coil regenerative set using duo-lateral wound coils, or a regenerative set using a vario-coupler and two variometers?

Ans. 1. We recommend the honeycomb coil for long waves above 600 or 1,000 meters but prefer the vario-coupler and variometers for waves below 600 meters.

H. N. P., Lyndhurst, N. J.

Q. 1. In the March issue of THE WIRELESS AGE on page 39, article entitled "The Case Against the Storage Battery" (Second prize) J. Greenfield. Can you inform me the kind of transformer used to eliminate the hum. This transformer is used between the set and head phones.

2200 Ohms
List Price
Only
$9.00

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HEAD PHONES

Highly sensitive Matched receivers Natural in tone. Each receiver tested by radio. Light weight (11 oz.) Comfortable to wear. Specially designed adjustable headband. Will not distort signals when amplified. Articulation is perfect.

There are many types of head sets on the market but not too many good ones. The GLOBE RADIO HEAD SET incorporates a knowledge of acoustics not possessed by other companies. It embodies correct design with the best of materials.

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Makes one jack take two plugs
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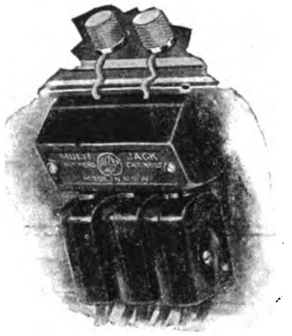

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Licensed under Armstrong Patents. Send 5 Cents for our new Catalog No. 3.

The C. D. Tuska Company
26 Hoadley Place
Hartford, Conn.

Ans. 1. This is a telephone transformer and is employed so that low resistance phones can be used. You should be able to purchase this from some telephone dealer.

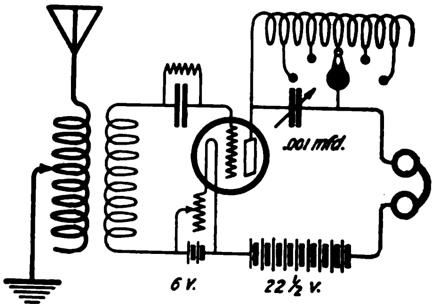
F. D. W., Oakland, Cal.

Q. 1. Would like to obtain more information concerning a solution given in March issue of this year, concerning "Filament and Plate Current Direct from A.C. Supply" on page 38. 440 Turns of No. 3 D.C.C. wire are specified. Why is such a large size wire used? Will No. 14 D.C.C. do?

Ans. 1. This was an error and should have read No. 32 D.C.C.

C. L. S., West Corinth, Vt.

Q. 1. I have a Navy type receiving transformer for wave lengths running up to probably 4,000 by using a loading coil. Can a coil be placed in inductive relation to secondary in plate circuit of detector tube to make a regenerative hook-up. I have four steps of amplification, but would like same results with less expense if possible. It it can be accomplished, please give diagram and description in your paper.



Ans. 1. Suggest that you employ the tuned plate circuit as shown. Wind a tube 10 inches in length by 3 inches wide with about eight inches of No. 24 D.C.C. taking a tap off every inch. Connect as shown.

Q. 2. I have a receiving station with four amplifying units. Is there any practical way to utilize the 32-volt farm lighting plant power for the plate voltage. I also have a Magnavox Loud Speaker and you will note it takes quite a volume of voltage for the entire outfit ranging from 16 to 22½ on detector to slightly over 100 on last step to get volume for horn. Kindly reply through your paper.

Ans. 2. The only way to use your 32 volts lighting circuit is to use it on the filaments and connect a suitable resistance in series to reduce the voltage to the proper value. I think you will have to contine using dry cell "B" batteries for best results.

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That there should be imitations of these nationally famous minerals is to be expected. We welcome fair competition. But unscrupulous imitations are unfair both to you, the user or dealer and to us, the pioneer producers of tested crystals.

Certain unscrupulous manufacturers are marketing so-called tested minerals in packages closely resembling the famous NAA containers. We have obtained and tested dozens of these so-called tested crystals — some are without a sensitive spot on their surface—others are of mediocre quality—not one meets the rigid requirements of our testing laboratories.

We sell *sensitiveness*, not bulk minerals. Pounds of crystals are worthless—Galena, for instance, is cheap—the market price is less than 3c a lb. For crystals worthy of efficient radio use insist upon the genuine NAA (Arlington tested) Detector Crystals. For your own protection look for the signature of J. S. NEWMAN, the originator, on every container. It will insure *guaranteed* sensitiveness. Each is packed in lithographed metal container. The mounted crystals are set into brass cups and packed in enameled turned wood boxes.

NAA Galena, Silicon or Goldite, price per crystal, post paid, $0.25. Mounted, set in woods, metal in brass cup, price per crystal, post paid, $0.40.

We will gladly replace without charge any NAA Crystal that does not function to the entire satisfaction of the user. Send for complete 80 page radio catalog describing these crystals, The Teagle Line, "Red-Head" Radio Receivers and all the leading makes of Radio Equipment. The Newman-Stern Company, Cleveland, O.

$8.00

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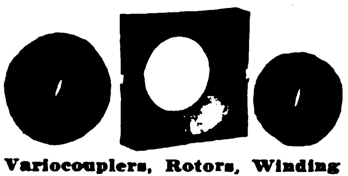

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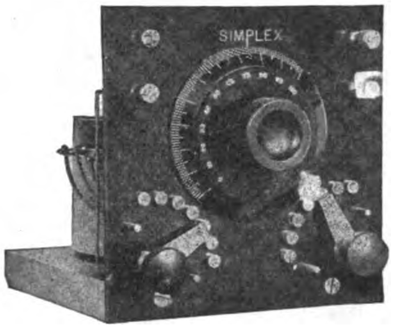

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Type 127A

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All transmitting sets, and continuous wave sets in particular, require ammeters to obtain the best results. You cannot depend on the other fellow's ear. The circuits from input to output must be adjusted by ammeters.

The hot wire ammeter is the universal meter for this service. It is adapted for direct current, low frequency alternating current and for radio frequency. It can be checked at any time on direct current and will be equally accurate on radio frequency. As this action depends on the fundamental I^2R law, it always measures actual effective amperes.

We recommend for this service our Type 127 hot wire ammeter. This meter employs a platinum expansion element and is rugged and reliable. The diameter is three inches and this meter is made in front-of-panel and flush-mounting models. It is supplied in a variety of convenient ranges. The price is also right.

PRICE $7.75

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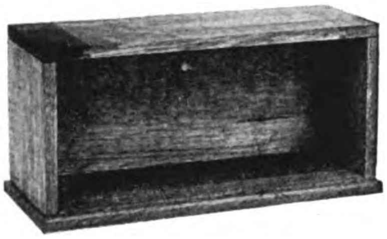

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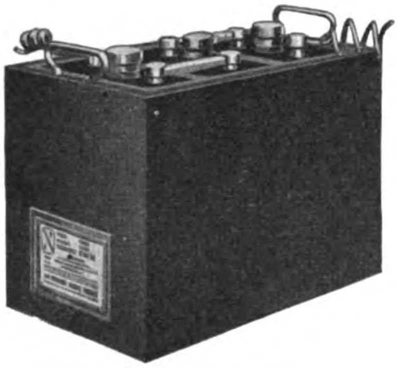

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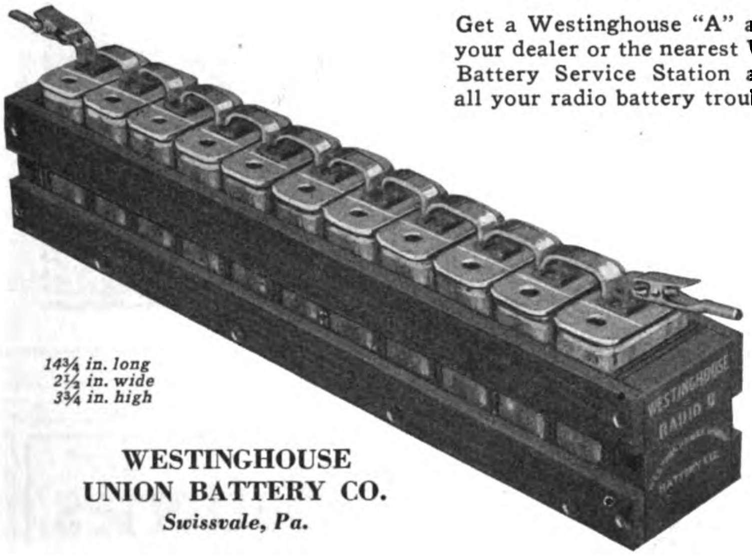

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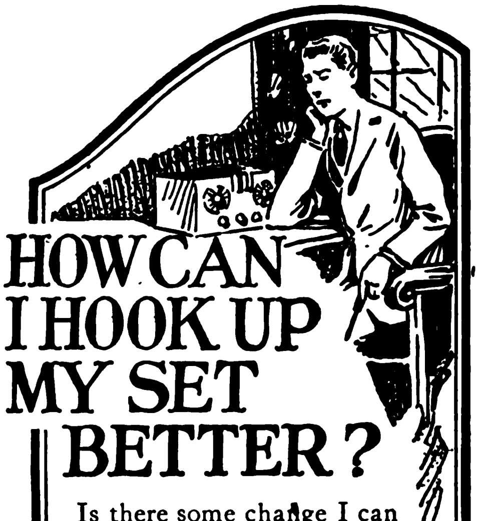

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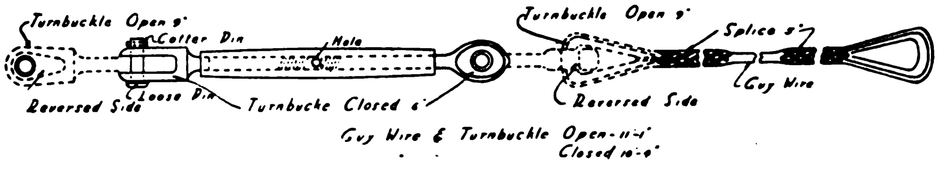

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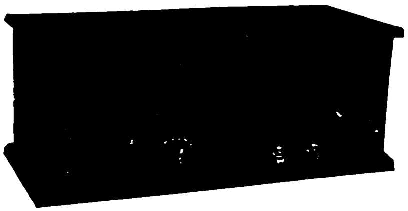

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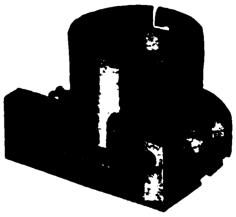
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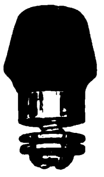

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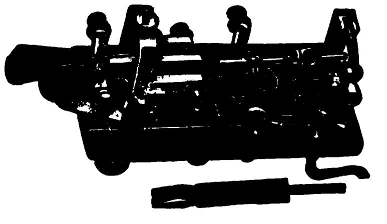

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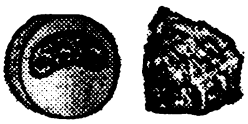

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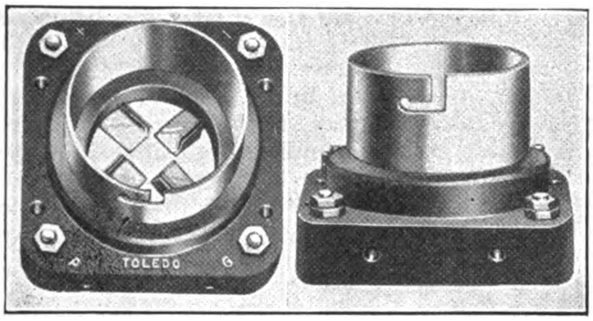

Our No. 666 positive contact socket has brass receptacle, nickel plated, moulded into bakelite socket. Allowance made in diameter of receptacle for the varying diameters of tube bases. Socket contacts insure certain and positive contact with the end and side of prongs of bulb. As socket is moved in the notch a pressure is immediately exerted on the side of the phosphor bronze contacts.

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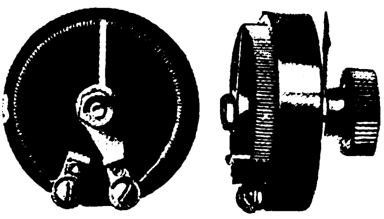

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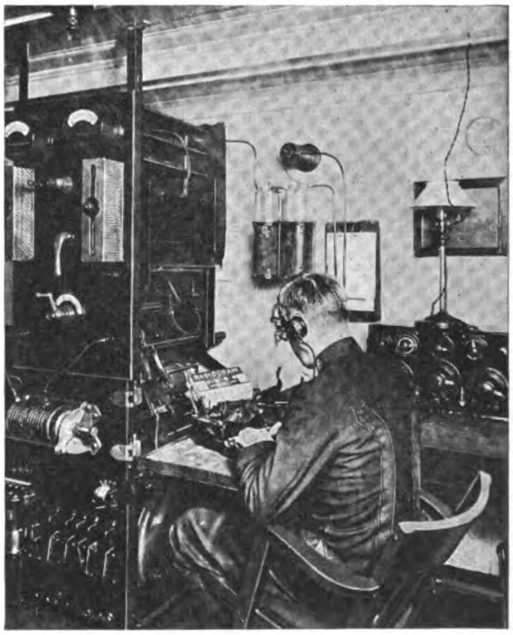

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The basic vacuum tube patents will shortly expire and the field will then be clear for all. Nevertheless, there have been many patents—and important ones—for methods of construction. The invention now offered for sale is one of these and anyone who appreciates the immense future for vacuum tubes for transmission and reception will realise what a great asset it would be to possess a method of construction applicable to the smallest and the largest tubes, a method ingenious in its conception and yet one which has been commercially used with great success by one of the largest lamp manufacturing concerns in the World.

The invention is in the name of John Scott-Taggart and nearly all the types of valves manufactured by the Edison Swan Electric Co. Ltd., of London have utilised this particular method of construction (described in the corresponding British Patent 159920).

The chief advantages of the method are:—

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(2). Great rigidity.

(3). No masses of metal which never get properly heated during the exhaustion process.

(4). A higher vacuum is attainable.

(5). Adaptability to any type of tube using cylindrical or flat plates.

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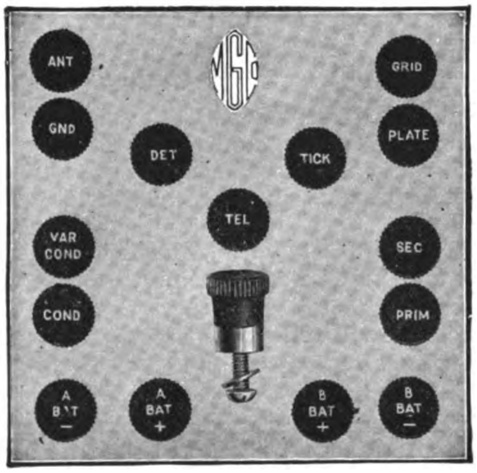

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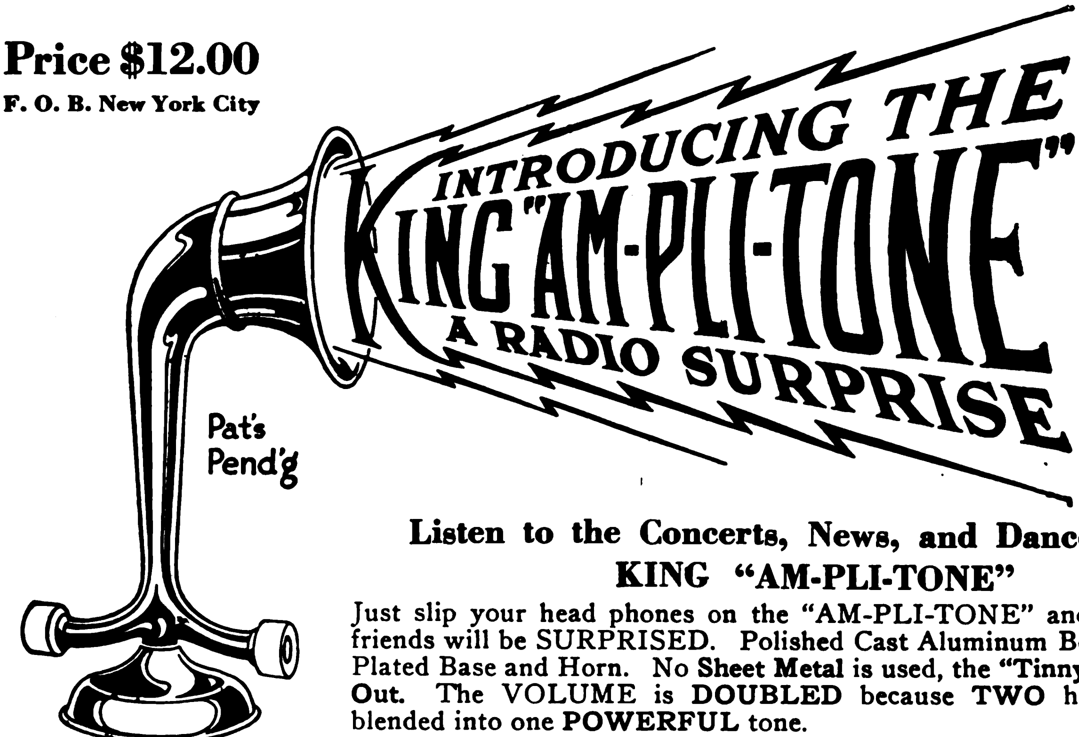

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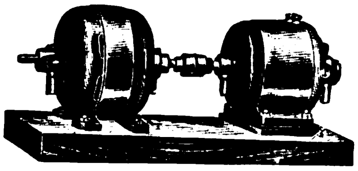

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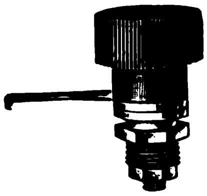

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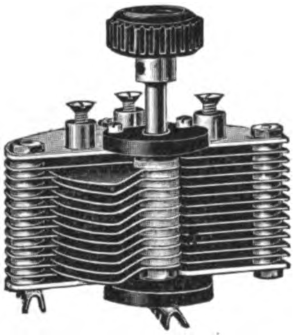

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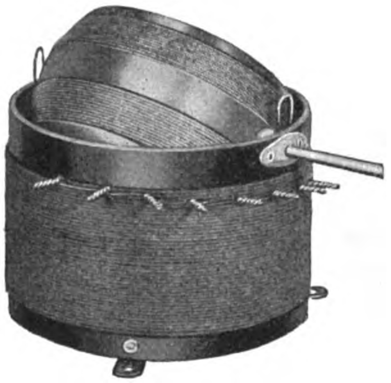

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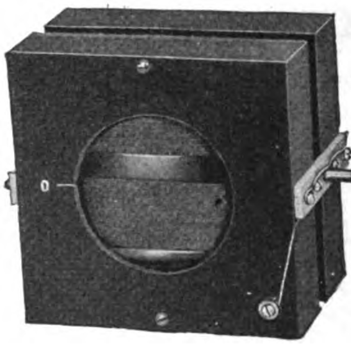

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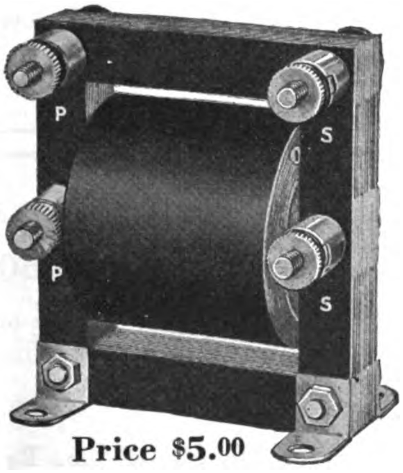

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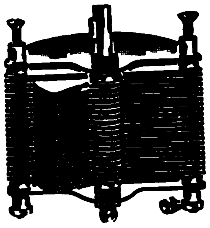

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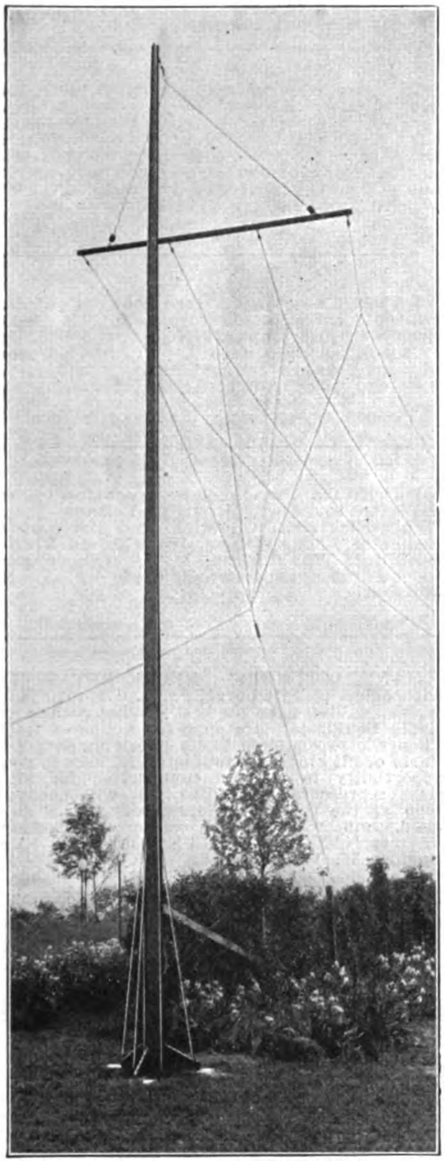

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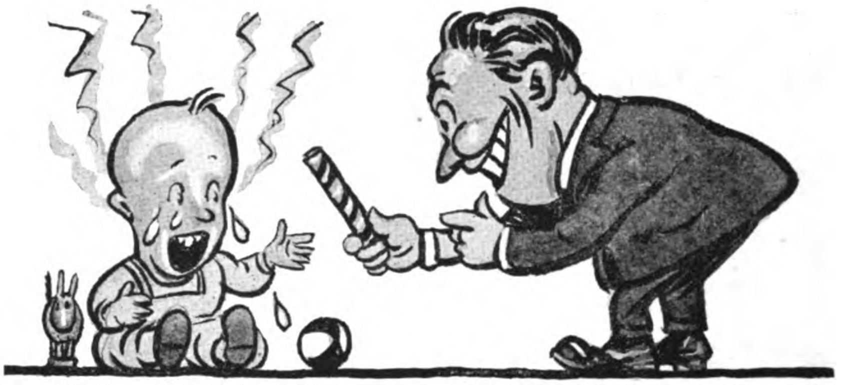

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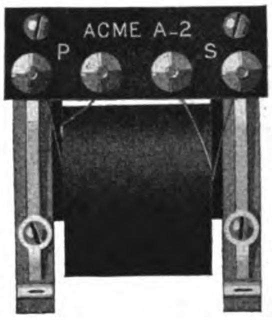

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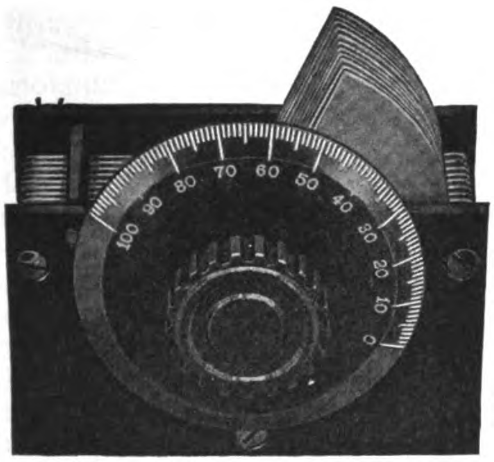

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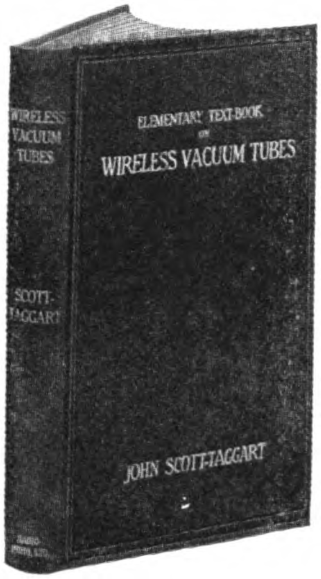

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First District

1 GD	Gardner, Bryant H., 57 Day Ave....Westfield Mass.
1 HH	Gordon, Fred W., West Road..Belgrade Lakes, Maine
1 LH	Tabbut, A. Ralph, 6 First South St., Bar Harbor, Maine
1 LI	Wilson, Vernon K., 5 West St.,....Portland, Maine
1 LO	Guillemette, Joseph D., 70 Magill St., Pawtucket, R. I.
1 NX	Novak, Nathan,3719 No. Main St., Bridgeport Conn.
1 PS	Meriden Radio Club, 35 Colony St.....Meriden, Conn.
1 QC	Keyes, Ernest R., 311 Nahatan St...Norwood, Mass.
1 QE	Van Allen, Edward J., 26 Park Row..Stamford, Conn.
1 QW	Eckert, Clendenin, Strawberry Hill..Stamford, Conn.
1 RG	Bowman, Everett L., 96 Water St....Clinton, Mass.
1 RR	Cavallini Elio, G., 305 Court St ....Plymouth, Mass.
1 RS	Klein, William G., 20 Fairfield St., Springfield, Mass.
1 SA	Stagg, Charles H., 1739 Dixwell Ave., New Haven, Conn.
1 SG	Woodward, Dudley B., 35 Pond St...Greenfield, Mass.
1 SO	Dinsmore, Rodney L., 37 Shawmut St., So. Portland, Maine
1 SM	Sloan Edgar T., 151 Oxford St........Hartford, Conn.
1 ST	Lemieux, Gustave, 657 Main St........Berlin, N. H.
1 TA	Gallagher, Raymond, 19 Chautauqua Ave., Nashua, N. H.
1 TC	Gregory, Horace E., 3 Lewis St.....Norwalk, Conn.
1 TD	Arey, Charles K., 217 Preble St., So. Portland, Maine
1 TE	Bessette, Raymond P. Sulford St., So. Bellingham, Mass.
1 TM	Gibbs, Arthur B., Spring St., Vineyard Haven, Mass.
1 TO	McDermott, William J., 31 Pleasant St..Bristol, Conn.
1 TQ	Ferris, Paul F., 316 Lynnfield St........Lynn, Mass.
1 TT	Tepper, Donald T., 58 East Haverhill St., Lawrence, Mass.
1 TX	McIntyre, John I., 10 Violet St........Lynn Mass.
1 TV	Fay, Marshall H., 36 Park Ave....Winchester, Mass.
1 UA	Pierce, John A., 100 Main St..........Orono, Maine
1 UE	Bosse, Armand J., 239 Blake St....Lewiston, Maine
1 UL	Shepard, Ernest L., 76 Pine St........Bath, Maine
1 UT	Moody, Norman B., 6 Noyes Place....Augusta, Maine
1 UU	Waite, Gordon D., 18 Ware St......Lewiston Maine
1 UV	Cameron, Ralph W. E., 145 Galen St., Watertown, Mass.
1 UW	Elder, Thomas P., 68 Williams St., New London, Conn.
1 UX	East Bridgewater High School, East Bridgewater, Mass.
1 VA	Palmer, Clarence E., 66 Marne St..New Haven, Conn.
1 VB	Foley, Francis 559 Washington St..Denham, Mass.
1 VD	Allen, John, 53 Garfield St......Springfield, Mass.
1 VE	Petersen, R. Lee, 11 Lunt St...Norfolk Downs, Mass.
1 VG	Cormier, Ernest J., 26 Locke St., No. Cambridge, Mass.
1 VH	Macdonald, Herbert C., 109 Stow St..Waltham, Mass.
1 VK	Simmons, Norman R., 45 Oakland St..Bristol Conn.
1 VN	Potts, Leslie T., 11 Allyn St........Holyoke, Mass.
1 VO	Stacker, Robert J., 48 Mountain Ave...Winsted, Conn.
1 VS	Halapian, John H., 73 Wellington St., Worcester, Mass.
1 WA	Bigelow, Henry M. L., 1 Fennway Road, West Hartford, Conn.
1 WC	Hartmann Mfg. Co., 308 Pearl St....Hartford, Conn.
1 WE	Northrop, Robert L..................Weatogue, Conn.
1 WI	Hanson, Kermit F., 126 Brown St., So. Portland, Maine
1 WL	Morin, Hobart L., Berry Ave..West Yarmouth, Mass.
1 WM	Frueh, Frederick G., 20 Arcadia Park, Dorchester, Mass.
1 WN	Duffy, Charles E., 55 Bloomfield St., Dorchester, Mass.
1 WV	Sawyer, Arthur W., 33 High St....Yarmouth, Maine
1 WX	Sauer, Charles R., Old Field Road..Fairfield, Conn.
1 AAH	Kunz, Clifford A., 9 Harris Ave., Jamaica Plain, Mass.
1 AAL	Donahue, Leonard M...................Richmond, Vt.
1 AAN	Hatch, Harold P., 150 School St......Everett, Mass.
1 AAT	Carder, Robert W., 23 Chardon Road, W. Medford, Mass.
1 ABD	Ballou, Everett T., 35 West Main St....Ware, Mass.
1 ACF	Donato, Frank, 882 Howard Ave.,..New Haven, Conn.
1 AJU	Cole, George E., 350 Piedmont St., Waterbury, Conn.
1 BJZ	Hotchkiss, Alan W., Pond Point Beach, Milford, Conn.
1 BZL	Grundy, Leslie W., Main St.........Phillips, Maine

CHANGE OF ADDRESS

1 TL	Wilmott, Roy E., 108 Anderson Ave., West Haven, Conn.
1 ARX	Boynton, A. S., 13 Griswold St......Meriden, Conn.
1 ASY	Goss, Horace, Box 1.........................Essex, Conn.
1 CJX	Stetson, Thurston L., 51 West St....Elmwood, Mass.

Seventh District

7 AE	Edgar, Thornton, R. F. D. No. 3, Walla Walla, Wash.

Eighth District

RE-ASSIGNED CALLS

8 BF	Orrie Baumgardner, 4409 Lorain Ave..Cleveland, Ohio
8 DJ	Donald C. Meyer, 9714 Lamont Ave..Cleveland, Ohio
8 GC	W. G. Chandler, Blank St...........Sylvania, Ohio
8 HZ	Donald L. Ross, 122 Midwood Ave......Toledo, Ohio
8 IH	Howard C. Barton, 18 Myrtle St........LeRoy, N. Y.
8 JI	L. Miller Andrus, 505 E. Higham St..St. Johns, Mich.
8 JK	Russell L. Schwing, 15 University Ave..Buffalo, N. Y.
8 KH	Carl G. Gutman, 3584 E. 120th St., Cleveland, Ohio
8 KN	Melvin A. Leach, Lansing High Shool, Seymour & Shiawasse, Lansing, Mich.
8 LZ	Sherman B. Landman, 134 S. Oakley Ave., Columbus, Ohio
8 MI	L. Russell York, 4555 Harding Ave..Detroit, Mich.
8 MU	Myron H. Premus, 53 McKinley Ave., Kenmore, N. Y.
8 PD	Elmer Priebe, 3887 W. 37th St......Cleveland, Ohio
8 PJ	Chas. S. Taylor, 598 Masten St......Buffalo, N. Y.
8 PU	K. A. Duerk, 309 Clinton St........Defiance, Ohio
8 PW	John C. Slade, R. F. D. No. 3.....Hamilton, Ohio
8 QF	Orange Publishing Co., Inc., 922 Irving Ave., Syracuse, N. Y.
8 RX	Harlan N. Walker, 114 Glendale St., Highland Park, Mich.
8 SZ	St. Lawrence Univ., Park St..........Canton, N. Y.
8 TF	Percival R. Piper, 3807 Kirby Ave., W. Detroit, Mich.
8 TO	Fred J. Kuchlick, 622 Vine St......Coshocton, Ohio
8 UD	Clark W. Mawby, 1000 Pitkin Ave......Akron, Ohio
8 UN	Jo Bradley Reed, 305 W. 7th St....Marysville, Ohio
8 UR	Fred Cain, 1224 Bryden Rd.........Columbus, Ohio
8 WP	Jas. W. Speer, 2994 Euclid Hts. Blve., Cleveland Hts., Ohio
8 ABU	L. L. Charmicky, 9604 Sophia Ave....Cleveland, Ohio
8 ACB	Arthur D. Lewis ....Glenlyon, Pa.
8 ACN	Albert Bentz, 3545 Hazelhurst Av......Toledo, Ohio
8 ADW	Ralph M. Smith, 2249 McGraw Ave..Detroit, Mich.
8 AGK	Clayton M. Blake, 188 Poplar St....Wyandotte, Mich.
8 AIH	Russell M. McBride, 218 Woodward Ave., N. Birmingham, Mich.
8 AJI	Gerald E. Hyter, 1319 Felt St..........Toledo, Ohio
8 AJT	Phillip Schwartz, 218 Grant St......Washington, Pa.
8 AOR	Harry Bastyr, R. F. D. No. 2, Catherine St., Glenshaw, Pa.
8 ARH	Norman C. Reynolds, 105 Krettner St..Buffalo, N. Y.
8 AWN	Clinton A. Petry, 603 Wayne Ave....Greenville, Ohio
8 AJE	Clyde W. Champness, 3716 W. 46th St., Cleveland, Ohio
8 BAK	Carlisle Schroeder, 40 VanAlstyne Blvd., Wyandotte, Mich.
8 BFS	Willard F. Diehl, Y. M. C. A., 2nd & Market, Hamilton, Ohio
8 BJK	George Maxim, 11505 Lake Shore Blvd., Cleveland, Ohio
8 BJV	Ralph W. Harris, 1099 Bigfalls Ave....Akron, Ohio
8 BKR	Cyril W. Dawson, Reginald O. Dawson, 53 Jefferson St., Norwalk, Ohio
8 BUB	Otis R. Barrall, 276 E. Green St....Nanticoke, Pa.
8 BQL	Durwood L. Bensinger.................Elsie, Mich.
8 BVA	Reid Whipple 80 Third St......Gloversville, N. Y.
8 BWF	Harry C. Yingling, 252 Charles Ave., New Kensington, Pa.
8 CAK	Alfred L. McCauley, 176 Roseneath Ave., Battle Creek, Mich.
8 CDH	William Zellers, 4386 Turney Rd....Cleveland, Ohio
8 CEV	Harry C. Hopkins ....Auburn, N. Y.
8 CGP	Leo S. Gordon, 318 E. South St.........Corry, Pa.
8 CKR	Barney J. Kucera, 4615 Lester Ave....Cleveland, Ohio
8 CKV	Ralph E. Humes, 834 Jefferson St., Springfield, Ohio
8 CKX	Syracuse Boys' Club, 436 Jefferson St., E. Syracuse, N. Y
8 CLJ	Nathan Williams, 1411 Main St.......Buffalo N. Y.
8 COW	Malcolm J. Stevens, 1545 Belvidere St., Detroit, Mich.

NEW CALLS

8 CQN	Raymond E. Gower, 636 3rd Ave..Williamsport, Pa.
8 CQO	Ira J. Barber, 504 S. State St., Clark's Summit, Pa.
8 CQP	A. Paul Ruzynsky, 21 E. Broad St., W. Hazelton, Pa.
8 CQQ	Warren A. Somers ....Derrick City, Pa.
8 CQR	Clay D. Richards, Dewey Ave......Barnard, N. Y.
8 CQS	Lloyd I. Sinn, 726 Prospect St.....Van Wert, Ohio
8 CQT	Joseph B. McCune, 488 Fifth St........Donora, Pa.
8 CQU	Chas. H. Heiser, 733 New York Ave..Columbus Ohio
8 CQV	Carl F. Walsh, 304 Jay St..........Rochester, N. Y.
8 CQW	Clarence E. Burke, 453 Avenue D..Rochester, N. Y.
8 CQX	Howard A. Thompson, 3401 Ridgway St., Pittsburgh, Pa.
8 CQY	Miles H. Robin, 7 Lake Ave........Williamson, N. Y.
8 CQZ	Chas. W. Pfister, Johnson St..........Osborn, Ohio
8 CRA	Algeir Ahrens, 47 N. Main St...Canandaigua, N. Y.
8 CRB	Chas. F. Swoboda, 16475 Libby Rd., Maple Heights, Ohio
8 CRC	Henry R. Spelman, 937 Harriet Ave., N. W., Canton Ohio
8 CRD	Fred. F. Sauer, 1924 Forestdale Ave., Cleveland, Ohio
8 CRE	Harold M. Keckley, 3327 Detroit Ave..Toledo, Ohio
8 CRF	Kenneth Neubrecht, 1160 Yondota St..Toledo, Ohio
8 CRG	John Wm. Lang, 774 Northampton St..Buffalo, N. Y.
8 CRH	Loren D. Macomber, 463 Auburn Ave....Buffalo, N. Y.
8 CRI	Clifford C. Mosher, Jr., 1044 W. Market St., Lima, Ohio
8 CRJ	John R. Dauberman, 615 St. Catherine St., Lewisburg, Pa.
8 CRK	Gilbert Stybr, 175 Galley Ave., Ross Township Pa.
8 CRL	Wm. C. Albertson, 5400 Stanton Ave..Pittsburgh, Pa.
8 CRM	Walter J. Krager, 39 Franklin St..Cattaraugus, N. Y.
8 CRN	Anton K. Rehor, 16350 Libby Rd., Maple Heights, Ohio
8 CRO	Clarence G. Keener, 215 Giffin Ave..Pittsburgh, Pa.
8 CRP	Bryant W. Pocock, 1715 Chicago Blvd., Detroit, Mich.
8 CRQ	Garnett F. Roberts, Mastin Park....Buffalo, N. Y.
8 CRR	Starke R. Hathaway, 602 S. Maple St., Marysville, Ohio
8 CRS	Lawrence D. Trevett, Buffalo St..Orchard Park N. Y.
8 CRT	John W. Dixon, 1875 Charles Rd., East Cleveland, Ohio
8 CRU	Donald W. Exner ....Silver Bay, N. Y.
8 CRV	Robert Swain, 713 E. University St., Ann Arbor, Mich.
8 CRW	John H. Brabb, 159 Lawrence Ave....Detroit, Mich.
8 CRX	Howard C. Hanna, 13802 Woodward Rd., E. Cleveland, Ohio
8 CRY	Wm. T. Munson, 13524 Ashburton Rd., Cleveland, Ohio
8 CRZ	George W. Stone, Jr., 9 Evershed St., Niagara Falls, N. Y.
8 CSA	Alphonse Brezinski 12 Rauber St....Rochester, N. Y.
8 CSB	Leland L. Lathrop ....Berkey, Ohio
8 CSC	Bert Drummond ....White Pigeon, Mich.
8 CSD	Branko Lasich, 16 Eureka St........Pittsburgh, Pa.
8 CSE	Raymond Lotzar, 439 Fernwood Ave..Rochester, N. Y.
8 CSF	Elmer Jila, 4304 E. 126th St........Cleveland, Ohio
8 CSG	Irving W. Littlefield, 147 Moulton Ave., Kenmore, N. Y.
8 CBH	Norman Heilbrun, 425 West Ave......Buffalo, N. Y.
8 CSI	John J. Long, Jr., 205 Prospect St., Canandaigua, N. Y.
8 CSJ	Vito Grieco, 183 Weddale Way......Rochester, N. Y.
8 CSK	Wilson J. Cox 9902 Pierpont Ave....Cleveland, Ohio
8 CSL	Russell F. Kehr, 3216 Cherry St........Toledo, Ohio
8 CSM	S. L. Biesecker, 335 S. Clinton Ave..Rochester, N. Y.
8 CSN	Elmer W. Boehmer, 101 Main St....Hamburg, N. Y.
8 CSO	Roy Butler, 317 S. Main St.............Akron, Ohio
8 CSP	Frederick R. Messmer, 611 Markinson Ave., Columbus, Ohio
8 CSQ	Howard Mattes, 189 Avenue B.........Rochester, N. Y.
8 CSR	Glover S. Mohr, 302 N. Cherry St..Paulding, Ohio
8 CSS	James R. Nelson, 418 Caroline St..Herkimer, N. Y.
8 CST	Marion Y. Law, Thomas St........Scottsville, Mich.
8 CSU	William E. Fuller 639 M. A. C. Ave., East Lansing, Mich.
8 CSV	Fred. W. Blackman, 157 Forrest St......Clyde, Ohio
8 CSW	Bernard Eveleigh, 142 E. Hoard St..Watertown, N. Y.
8 CSX	Lawrence E. Forman, 176 North St....Buffalo, N. Y.
8 CSY	Eckley B. C. Markle, 321 W. Broad St., Hazelton, Pa.
8 CSZ	Louis H. Frost, 112 Hatch St......Syracuse, N. Y.

SPECIAL AMATEUR STATIONS

8 ZAF	Robt. C. Bohannan, 1188 Willard Ave., Columbus, Ohio
8 ZL	Charles Candler, 105 S. Ash St....St. Marys, Ohio
8 ZH	Cino Radio Mfg. Co., 218 W. 12th St., Cincinnati, Ohio
8 ZZ	Clyde E. Darr, 137 Hill Ave., Highland Park, Mich.
8 ZP	Edw. I. Deighan, 5415 Hermann Ave., Cleveland, Ohio
8 ZY	K. A. Duerk, 1000 Wilhelm St......Defiance, Ohio
8 ZM	Cyrus H. Fraser, 48 Glenwood Ave..Buffalo, N. Y.
8 ZE	Clarence T. Hewitt, 7942 Westmoreland Ave., Swissvale, Pa.
8 ZQ	Roy C. Ehrhardt, 117 S. Blakely St., Dunmore, Pa.
8 ZB	Earl S. Ensign Wm. Van Behren, 923 W. Bancroft St., Toledo, Ohio
8 ZAD	Experimental Radio Association......Mayville, N. Y.
8 ZAC	Clifford H. Galloway, 612 Park St., Barnesville, Ohio
8 ZK	A. M. Lindsay, Jr., 600 Park Ave..Rochester, N. Y.
8 ZG	A. J. Manning, 252 McKinley St......Salem, Ohio
8 ZA	Chas. J. Murray 718-726 W. Fair St., New Philadelphia, Ohio
8 ZF	Maurice H. Pancost, 1101 Climax St..Lansing, Mich.
8 ZAB	Shotton Radio Mfg. Co., 413 Connel Bldg., Scranton, Pa.
8 ZS	John H. Stenger, Sr., 66 Gildersleeve St., Wilkes-Barre, Pa.
8 ZW	John C. Strobel, Jr., National Rd..Wheeling, W. Va.
8 ZX	Harry S. Weber, 1113 Walnut St......Dover, Ohio
8 ZD	Parker E. Wiggin, 412 Whitney Ave., Wilkinsburg, Pa.
8 ZAE	Burton P. Williams, 3220 Orleans St., Pittsburgh, Pa.
8 ZO	Loren G. Windom, 1375 Franklin Ave. Columbus, Ohio
8 ZAA	J. Warren Wright, 1119 S. Fountain St., Springfield, Ohio
8 ZN	J. W. Kauffman, 208 Claremont Ave..Ashland, Ohio
8 XA	Univ. of Michigan, Dept. of Elec. Eng., Ann Arbor, Mich.
8 XB	Precision Equipment Co., 2437 Gilbert Ave., Cincinnati, Ohio
8 XD	Ford Motor Co. ....Dearborn, Mich.
8 XE	Penna. State College ....State College, Pa.
8 XG	Washington & Jefferson College, Department of Physics, Washington, Pa.
8 XH	P. E. Wiggin, 412 Whitney Ave..Pittsburgh Pa.
8 XJ	Ohio State Univ., Elec. Eng. Dept..Columbus, Ohio
8 XK	Frank Conrad, 7712 Penn Ave......Pittsburgh, Pa.
8 XL	Ford Motor Co. ....Northville, Mich.
8 XM	M. H. Pancost, 1101 Climax St......Lansing, Mich.
8 XN	Bucknell Univ., Dept. Elect. Eng..Lewisburg, Pa.
8 XO	The Detroit News, 615 Lafayette Blvd., Detroit, Mich.
8 XP	The Detroit Edison ....Port Huron, Mich.
8 XS	Wilcox Laboratories, 131 S. Fairview Ave., Lansing, Mich.
8 XU	Cornell University, Franklin Hall....Ithaca, N. Y.
8 XV	F. S. McCullough 126 Lincoln Ave..Pittsburgh, Pa.
8 XAD	Federal Telephone & Telegraph Co., 1738 Elmwood Ave., Buffalo, N. Y.
8 XAE	Henry B. Joy, 1740 Penobscot Bldg., Detroit, Mich.
8 XAF	Howard P. Hardesty, 396 Monteray Ave., Highland Park, Mich.
8 XAG	Doron Bros. Elec. Co., 329 Terrace Ave., Hamilton, Ohio
8 XAH	Ohio Mechanics Institute ....Cincinnati, Ohio
8 XAK	Wittenburg College, Carnegie Science Hall, Springfield, Ohio

GENERAL PUBLIC STATIONS

WFK	Ann Arbor Railway Co............Frankfort, Mich.
WLD	Pere Marquette R. R. Co.........Ludington Mich.

TECH. AND TRAINING SCHOOL STATIONS

8 YA	Edw. L. Colby, Cor. Genesee & South, Auburn, N. Y.
8 YD	Shaw Tech. School ....E. Cleveland, Ohio
8 YG	Mich. Agri. College, Elec. Eng Dept., E. Lansing, Mich.
8 YH	W. Virginia Univ., Dept. of Physics, Morgantown, W. Va.
8 YI	Univ. of Pittsburgh, Dept. Elec. Eng., Pittsburgh, Pa.
8 YK	Ohio Wesleyan Univ., S. Sandusky St., Delaware, Ohio
8 YM	Denison Univ., Dept. of Physics.....Granville Ohio
8 YN	Battle Creek High, Van Buren....Battle Creek, Mich.
8 YO	Ohio State Univ., Dept. Elec. Eng....Columbus, Ohio
8 YQ	Independent Wireless Telegraph Co., Main & Tupper, Buffalo, N. Y.
8 YR	Miami Univ. ....Oxford, Ohio
8 YS	Univ. of Cincinnati, Dept. of Physics, Cincinnati, Ohio
8 YT	Mt. Union College ....Alliance, Ohio
8 YU	Y. M. C. A. ....Dayton, Ohio
8 YV	Grove City College ....Grove City, Pa.
8 YAA	Marietta College, Dept. of Physics....Marietta, Ohio
8 YAB	Scott High School, Collingwood Ave....Toledo, Ohio
8 YAC	St. Xavier College, Victory Pkway. & Dana Cincinnati, Ohio
8 YAD	C. M. Howe, Board of Education..Cincinnati, Ohio
8 YAE	Oberlin College, Peters Hill..........Oberlin, Ohio
8 YAF	Univ. of Detroit, 650 E. Jefferson Ave., Detroit, Mich.

LIMITED COMMERCIAL STATIONS

KOP	Detroit Police Dept...................Detroit, Mich.
KQV	Doubleday-Hill Elec. Co., 719 Liberty Ave., Pittsburgh, Pa.
WBY	Illinois Pipe Line Co....................Lima, Ohio
WCQ	Illinois Pipe Line Co..............Findlay, Ohio
WFD	Ford Motor Co.....................Flat Rock, Mich.
WNA	Ford Motor Co.....................Dearborn, Mich.
WPZ	Ford Motor Co. River Rouge Station Springwells, Mich.
WCAA	Meade Pochahontas Coal Co.........Tralee, W. Va.
WCAF	Mich. Limestone & Chemical Co......Rogers, Mich.
KDEN	Ford Motor Co.....................Dearborn, Mich.
KDEP	Ford Motor Co...................Northville, Mich.

KDKA	Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
KDPH	Detroit Edison Co., 1700 David Whitney Bldg., Detroit, Mich.
KDPJ	Detroit Edison So................Port Huron, Mich.
KDPM	Westinghouse Elec. & Mfg. Co.....Cleveland, Ohio
KUXM	Warren W. Kathan, 335 Young St., Cheboygan, Mich.

BROADCASTING STATIONS

WCX	Detroit Free Press, 117 Lafayette Blvd., Detroit, Mich.
WFO	Rike-Kumler Co. ....Dayton, Ohio
WGR	Fed. Telephone & Telegraph Co. 1738 Elmwood Ave., Buffalo, N. Y.
WHD	W. Va. University ....Morgantown, W. Va.
WHK	Warren R. Cox, 5005 Euclid Ave., Cleveland, Ohio
WHQ	The Times-Union, 22 Exchange St..Rochester, N. Y.
WHU	Wm. B. Duck Co., 224 Superior St., Toledo, Ohio
WHW	U. S. Weather Bureau ....Lansing, Mich.
WIK	K. & L. Electric Co., 427 Olive St., McKeesport, Pa.
WIZ	Cino Radio Mfg. Co., 218 W. 12th St., Cincinnati, Ohio
WJD	Richard H. Howe, Denison Uiversity, Granville Ohio
WJK	Service Radio Equipment Co., 225 Superior St., Toledo, Ohio
WJT	Electric Equipment Co., 703 State St....Erie, Pa.
WLW	Crosley Mfg. Co ....Cincinnati, Ohio
WMH	Precision Equipment Co., 2437 Gilbert Ave., Cincinnati, Ohio
WOE	Buckeye Radio Service Co., 569 S. Main St., Akron, Ohio
WPG	Nushawg Poultry Farm, R. R. F. No. 2, New Lebanon, Ohio
WPI	Elect. Supply Co., 123 Market St..Clearfield, Pa.
WPL	Fergus Elec. Co., 524 Main St....Zanesville Ohio
WRK	Doron Bros. Elec. Co., 325 N. B. St., Hamilton, Ohio
WSL	J. & M. Elec. Co., 23-30 Bank Place..Utica, N. Y.
WSX	Erie Radio Co., Inc., 117 W. 9th St....Erie, Pa.
WTP	Geo. M. McBride, Peoples Theatre Co., Bay City, Mich.
WWB	Dailey News Printing Co., 402 2nd St. N. W., Canton, Ohio
WWI	Ford Motor Co. ....Dearborn, Mich.
WWJ	Detroit News, 615 Lafayette Blvd....Detroit, Mich.
WWT	McCarthy Bros. & Ford, 75 W. Mohawk St. Buffalo, N. Y.
WMC	Columbia Radio Co., So. Ave. at Indianola, Youngstown, Ohio
KQV	Doubleday Hill Elec. Co., 719 Liberty Ave., Pittsburgh, Pa.
WAAO	Radio Service Co., 1019 Quarrier St., Charleston, W. Va.
WAAV	Athens Radio Co., Box 282..........Athens, Ohio
WAAX	Radio Service Corp., 35 Haldane St., Crafton, Pa.
WAAY	Yahrling-Rayner Piano Co., 254 W. Federal St., Youngstown, Ohio
WAAR	Groves-Thorton Hardware Co. 822 4th St., Huntington, W. Va.
WBAB	Andrew J. Potter, 213 Westminster Ave., Syracuse, N. Y.
WBAJ	Marshall-Gerken Co., 27 Ontario St....Toledo, Ohio
WBAU	Republican Publishing Co., 3rd & Market Sts., Hamilton, Ohio
WBAV	Erner & Hopkins Co., 146 N. 3rd St., Columbus, Ohio
WBAW	Marietta College, 328 4th St......Marietta, Ohio
WBAX	John H. Stenger, Jr., 66 Gildersleeve St., Wilkes-Barre, Pa.
WCAE	Kaufmann & Baer Co. 6th & Smithfield Sts., Pittsburgh, Pa.
WCAD	St. Lawrence University ....Canton, N. Y.
WCAQ	Tri-State Radio Mfg. & Supply Co., 309 Clinton St., Defiance, Ohio

REGULAR LIST

8 HM	Grove City High School (by H. F. Harmon), Main St., Grove City, Pa.
8 HN	J. C. Adams, 48 N. Washbash Ave..Battle Creek, Mich.
8 HO	W. Weaver, Jr., 610 Church St......Ann Arbor, Mich.
8 HP	G. M. Benas, 1636 Elm St.............Utica, N. Y.
8 HQ	W. T. Pasanne, 21 Lamson Pl.........Detroit, Mich.
8 HR	W. A. Cawley, R. F. D. No. 3...........Milton, Pa.
8 HS	R. S. Munsell, 191 Center St..........Ashtabula, O.
8 HT	J. L. Egan, 120 Barton St.............Buffalo, N. Y.
8 HU	A. Anderson, Main St., Box No. 223.....Hubbard, O.
8 HV	L. H. Goldberg, 12011 Scottwood Ave....Cleveland, O.
8 HW	Le R. Daniels, Jonesville St.........Litchfield, Mich.
8 HX	F. E. Lindblom, 21 Linden Ave.....Jamestown, N. Y.
8 HY	R. W. Shoop, 160½ Jefferson Ave.....Vandergrift, Pa.
8 HZ	W. D. Orser, 466 Augustine St.......Rochester, N. Y.

8 IA	G. A. Steinkamp, 1931 Clarion Ave.....Cincinnati, O.
8 IB	R. C. Higgy, 50 18th Ave..............Columbus, O.
8 IC	S. N. W. Huff, 915 Campbell St......Williamsport, Pa.
8 ID	R. G. Klipec, 11703 Kinsman Rd........Cleveland, O.
8 IE	H. N. Konrad, 750 Ross Ave............Hamilton, O.
8 IF	P. Heasley, 490 Iroquois Trail........Sawyerwood, O.
8 IG	F. J. Riley, 1824 E. 35th St...........Cleveland, O.
8 IH	E. L. Murrill ....Montgomery, W. Va.
8 II	P. W. Lister, 1167 Wheelock Ave.......Detroit, Mich.
8 IJ	H. W. Mason, 222 W. Main St...........Bellevue, O.
8 IK	J. W. Kauffman, 208 Claremont Ave......Ashland, O.
8 IL	L. A. Nerber, 41 Beattie Ave..........Lockport, N. Y.
8 IM	H. E. Wistermann, 2465 Lawton Ave........Toledo, O.
8 IN	S. Johnston, 10 E. Orchard Ave..........Bellevue, O.
8 IO	R. F. Schrecker, 543 E. 8th Ave.......Tarentum, Pa.
8 IP	G. A. Doerlght, 145 Illinois Ave.......Youngstown, O.
8 IQ	A. S. Bachtel, 26 Highland Ave............Akron, O.
8 IR	C. J. Taylor, 721 W. Delaware Ave.........Toledo, O.
8 IS	R. S. Stuchen, 1018 W. 29th St.............Erie, Pa.
8 IT	H. E. Stout, 514 Vine St..............Wyoming, O.
8 IU	R. E. Sibert, 109 E. Benton St.......Wapakoneta, O.
8 IV	T. A. Reid, 1219 N. Limestone St......Springfield, O.
8 IW	K. Chamberlain, Northwester High School..Detroit, Mich.
8 IX	H. D. Davie, Olean St.................Bolivar, N. Y.
8 IY	R. L. Gladke, 382 W. Church St.........Elmira, N. Y.
8 IZ	R. H. Sayles, Jr. ....Milan, O.

8 JA	F. S. Travis, 1090 Wilhelm St..........Defiance, O.
8 JB	H. W. Harmon, 418 Poplar St.........Grove City, Pa.
8 JC	C. O. Miller, 1131 Dean St...............Bucyrus, O.
8 JD	H. A. Oerting, 331 Parker Ave............Toledo, O.
8 JE	E. C. Jones, Jr., 522 Fairmont Ave...Fairmont, W. Va.
8 JF	R. W. Bosworth, 78 S. Professor St........Oberlin, O.
8 JG	W. D. MacPherson, 923 Nela View Rd....Cleveland, O.
8 JH	H. N. Magel ....Tippecanoe City, O.
8 JI	W. C. White, 1802 Josephine St........Cincinnati, O.
8 JJ	P. W. Towsley, 832 Hickory St.........Lansing, Mich.
8 JK	N. G. Almgren, 36 Park St...........Jamestown, N. Y.
8 JL	L. N. Chatterton, 12320 Woodside Ave....Cleveland, O.
8 JM	I. W. Copeland, 227 Claremont Ave......Ashland, O.
8 JN	A. A. Morse, Jr., R. F. D. No. 4....Wellsburg, W. Va.
8 JO	A. L. Van Tine, 176 Grant Ave......Vandergrift, Pa.
8 JP	O. A. Chamberlain, 83 W. Exchange St....Akron, O.
8 JQ	W. & L. Alexander, 135 S. College St..Washington, Pa.
8 JR	H. G. Huddle ....Napoleon, O.
8 JS	F. J. Burhans, 8 Elm St............Cobleskill, N. Y.
8 JT	F. H. Knapp, 1765 E. Main St.........Columbus, O.
8 JU	L. M. Ripple, 1601 2nd Ave. N. E.........Canton, O.
8 JV	F. P. Thomas, Charles & Brownsville Rd., Mount Oliver Station, Pittsburgh, Pa.
8 JW	W. E. MacLaren, 2979 Hampshire Rd., Cleveland Heights, O.
8 JX	J. Becker, 2680 Monroe St.............Detroit, Mich.
8 JY	P. Wright, Jr., 7 Gates Circle..........Buffalo, N. Y.
8 JZ	A. T. Sirrine, 46 E. 20th St..........Holland, Mich.

8 KA	H. E. Strong, 208 E. King St........Smethport, Pa.
8 KB	H. McGary, 5421 Avery Ave...........Detroit, Mich.
8 KC	F. Eberle, 3803 Lockwood Ave.............Toledo, O.
8 KD	R. A. Malloy, 1105 Melchoir Pl...........Canton, O.
8 KE	N. J. Ropar, 786 Delaware Ave........Youngstown, O.
8 KF	J. A. Vickery, 306 W. Main St..........Bellevue, O.
8 KG	J. W. Kidd, 404 Lafayette St..............Niles, O.
8 KH	B. T. Dreyer, 364 Mt. Clair Ave........Detroit, Mich.
8 KI	H. B. Roher, Broadway St........Tippecanoe City, O.
8 KJ	E. C. Denstaedt, 383 McDougall Ave....Detroit, Mich.
8 KK	N. R. Lamphier, 211 South St. W......Plainesville, O.
8 KL	H. W. Hancock, 337 S. Main St.....Charlotte, Mich.
8 KM	G. Belprez, 3457 Belvidere Ave..........Detroit, Mich.
8 KN	W. C. Albertson, 5400 Stanton Ave......Pittsburgh, Pa.
8 KO	W. McKenzie, 304 Borgess St..........Monroe, Mich.
8 KP	R. W. Stolzenbach, 724 W. Market St........Lima, O.
8 KQ	R. W. Harter, Pearl St..............Spencerville, O.
8 KR	J. T. Smart, 217 S. High St............Marion, O.
8 KS	C. E. Dengler, 285 Brown St.........Rochester, N. Y.
8 KT	E. Handler, 53 Vassar St............Rochester, N. Y.
8 KU	N. Frost, 5 Norway Park..............Buffalo, N. Y.
8 KV	L. Archer, 880 Prouty St................Toledo, O.
8 KW	G. Miller, 236 Barton St..............Barton, N. Y.
8 KX	R. Mitchell, 818 Brice Ave...............Lima, O.
8 KY	H. P. Hartman ....Bradwoods, Pa.
8 KZ	H. W. Lerch, 159 Cottage St..........Lockport, N. Y.

8 LA	J. E. Bromley, 301 Baynes St..........Buffalo, N. Y.
8 LB	G. B. Sears, 186 Exeter St............Buffalo, N. Y.
8 LC	P. A. Mitchell, 2328 E. 49th St........Cleveland, O.
8 LD	E. Ditty, 1487 Arthur Ave...............Lakewood, O.
8 LE	E. O. Dumas, Scott St..............Scottville, Mich.
8 LF	W. K. Thomas, 17 Emerson Ave..........Crafton, Pa.
8 LG	L. W. Kimley, 45 Kensington Ave.......Buffalo, N. Y.
8 LH	W. H. Raring, 20 Dunsmore St..........Crafton, Pa.
8 LI	C. L. Reynolds, 25 Sturges St......Binghamton, N. Y.
8 LJ	J. R. Hall, 219 North Ave...........Washington, Pa.
8 LK	J. E. Williams, 723 Oakland Ave....Ann Arbor, Mich.
8 LL	E. B. Ryan, 2105 Senator Ave..........Detroit, Mich.
8 LM	W. H. Cooney, 328 Sandusky St..........Conneaut, O.
8 LN	H. Terry, 601 Pasadena Ave............Detroit, Mich.
8 LO	A. R. Hill, 1846 Auburn Ave...........Cincinnati, O.
8 LP	H. A. Brickman, 1674 Wyandotte St.....Lakewood, O.
8 LQ	H. Grossman, 12343 Forest Grove Ave.....Cleveland, O.
8 LR	F. Bartholomew ....Perry, O.
8 LS	College of Wooster, Taylor Hall ....Wooster, O.
8 LT	W. B. Sanger, 89 S. Linwood St...........Norwalk, O.
8 LU	C. Breninger, 7993 Richmond Ave.......Detroit, Mich.
8 LV	E. W. Esslinger, 523 Miller Ave......Ann Arbor, Mich.
8 LW	H. L. Saire, 636 Maplewood Ave........Ambridge, Pa.
8 LX	C. A. Ingalls, 90 S. Linwood Ave.........Crafton, Pa.
8 LY	A. J. Wember, 736 Baker St..Muskegon Heights, Mich.
8 LZ	G. Stybr, R.F.D. No. 1, Box 316........Bellevue, Pa.

8 MA	Miami University ....Oxford, O.
8 MB	A. R. Miller, Ilinois St...............McDonald, O.
8 MC	M. C. Bartlett, 180 Parker St.........Detroit, Mich.
8 MD	G. E. Born, 230 Summit St., Mt. Oliver Station, Pittsburgh, Pa.
8 ME	Beaver High School, Market & 2nd Sts....Beaver, Pa.
8 MF	H. W. Woodmansee, 214 Morris Ave.....Buffalo, N. Y.
8 MG	W. Updike, Jr., 38 Margaret Ave. E....Detroit, Mich.
8 MH	H. C. Looney, 214 Purdy St.......Birmingham, Mich.
8 MI	K. Sliker, 709 5th St. N. W..............Canton, O.
8 MJ	P. Davis, 1259 Hayden Ave. E...........Cleveland, O.
8 MK	Radio News & Music Co. (Inc.).........Detroit, Mich.
8 ML	F. Murphy, Grd. Div. & Warner Rd......Cleveland, O.
8 MM	O. E. Swanson, 184 Bath St...............Elyria, O.
8 MN	A. E. Alger, 214 Arizona Ave..............Lorain, O.
8 MO	F. A. Ploetz, 754 Grand River Ave......Detroit, Mich.
8 MP	E. Hopponen, 1632 Euclid Ave..........Detroit, Mich.
8 MQ	W. P. Doty, 75 Steel St...............Auburn, N. Y.
8 MR	V. D. Wellington, 511 Gibbs Ave......Wapakoneta, O.
8 MS	D. Booth, 1524 Collingwood Ave...........Toledo, O.
8 MT	R. M. Sincock, 120 Lenox St.........Uniontown, Pa.
8 MU	W. G. Gallup, 147 Friedley Ave.........Bellevue, O.
8 MV	V. J. Coughenour ....Plattsburg, O.
8 MW	G. E. Lyman, 217 Morgan St............Oberlin, O.
8 MX	A. H. Hantman, 1485 Fairlawn Ave., Dormont, Pittsburg, Pa.
8 MY	D. G. Carter, Rathbone Pl........Grosse Pointe, Mich.
8 MZ	H. F. Wannemacher, 17 W. Main St...Lancaster, N. Y.

8 NA	E. Michel, 1053 Market St...........Meadville, Pa.
8 NB	M. H. Nelson, 525 Benton St........Rochester, N. Y.
8 NC	A. Kollmar, 20 Portage St.............Buffalo, N. Y.
8 ND	C. E. Miller, 71 Aurora St..........Lancaster, N. Y.
8 NE	A. J. Gogel, 411 Palmwood Ave..........Toledo, O.
8 NF	H. M. DeGowin, 110 N. Huron St....Cheboygan, Mich.
8 NG	J. Gafill, 506 Southfield Ave.......Birmingham, Mich.
8 NH	A. P. Vandergrift, 1019 Manhattan St..Pittsburgh, Pa.
8 NI	J. L. Eddy, Jr., The Knoll ....Ithaca, N. Y.
8 NJ	W. G. Broughton, 201 DeWitt Ave........Ithaca, N. Y.
8 NK	W. P. Van Behren, 2149 Scottwood Ave.....Toledo, O.
8 NL	J. J. Dunn, 2445 Townsend Ave........Detroit, Mich.
8 NM	D. R. Girardin, 625 Woodward Ave......Detroit, Mich.
8 NN	W. E. Brindley, 568 Coal St.........Wilkinsburg, Pa.
8 NO	P. Muscari, 812 E. Pike St........Clarksburg, W. Va.
8 NP	L. Chambers, 1521 E. 82nd St.........Cleveland, O.
8 NQ	C. H. Kreighbaum, 1256 E. 125th St....Cleveland, O.
8 NR	C. S. Bacon, 533½ Prouty St............Toledo, O.
8 NS	E. Hess, 4129 Carter Ave...............Norwood, O.
8 NT	E. W. Richards, 27 Roosevelt Ave...Binghamton, N. Y.
8 NU	J. H. Ferris, R. F. D. No. 1..........Elberta, Mich.
8 NV	J. A. Barlock, 1026 Talbot Ave.........Braddock, Pa.
8 NW	J. F. Eckel, 933 Bank St..............Cincinnati, O.
8 NX	G. E. Francis, Jr., 117 Magee Ave....Rochester, N. Y.
8 NY	M. J. McConnell, 134 Benham St.....Penn Yan, N. Y.
8 NZ	E. E. House, 272 N. Michigan Ave..Battle Creek, Mich.

8 OA	F. V. Hunt, 421 N. Chester St.........Barnesville, O.
8 OB	H. F. Kelso, Euclid & 4th Sts........Dravosburg, Pa.
8 OC	H. J. Lohman, 427 Olive St...........McKeesport, Pa.
8 OD	P. L. Pennock, Lincoln Way..............Minerva, O.
8 OE	F. J. Kahn, 8126 Linwood Ave..........Cleveland, O.
8 OF	M. L. Ruhl, 160 Martin Ave...........Columbus, O.
8 OG	L. C. Brothers, N. Main St............Wellington, O.
8 OH	N. F. Anger, 1029 Ferdinand Ave.......Detroit, Mich.
8 OI	A. B. Sparks, 159 Erie St..................Elyria, O.
8 OJ	N. Schlaack, 405 Knox St.........Birmingham, Mich.
8 OK	G.L.Stevenson, 205 Davidson Ave..Highland Park, Mich.
8 OL	T. Schmarzreddt, 9110 Fort St. W.......Detroit, Mich.
8 OM	J. R. Pell, Jr., 910 16th St.......Parkersburg, W. Va
8 ON	G. W. Finegan, 2 Fenwick St.........Rochester, N. Y.
8 OO	D. S. Perry, 514 Edgewood Pl..........Ithaca, N. Y.
8 OP	R. J. Lampe, 715 Leeson Ave............Van Wert, O.
8 OQ	P. D. Murphy, 162 Jefferson Ave.........Columbus, O.
8 OR	E. Gillam, 91 Calvert Ave............Detroit, Mich.
8 OS	N. E. Colegrove, 1899 Knowles St. ..East Cleveland, O.
8 OT	W. J. Wiseman, 436 Cherry Ave. N. E.....Canton, O.
8 OU	M. Meister, 2303 St. Clair St..........Cleveland, O.
8 OV	C. E. Heffelman, 3124 Tuscara St. W......Canton, O.
8 OW	A. Mag, 4212 Penn Ave..............Pittsburgh, Pa.
8 OX	C. H. Bogart, 112 W. Dewey St......Youngstown, O.
8 OY	W. H. Bullock, 1207 Taylor Ave........Ithaca, N. Y.
8 OZ	R. C. Leacock, 9200 Gratiot Ave........Detroit, Mich.

8 PA	J. F. McFarren, 1214 Chislett St......Pittsburgh, Pa.
8 PB	A. J. Hessinger, 135 Albany St.........Buffalo, N. Y.
8 PC	E. Haringx, 97 Aberdeen St..........Rochester, N. Y.
8 PD	T. A. March, 331 Shaw St...........New Castle, Pa.
8 PE	D. D. Emery, 1832 Harvey Pl. S. E.......Canton, O.
8 PF	C. G. Crowley, 76 Florida St...........Buffalo, N. Y
8 PG	W. J. Vallely, 166 Sterling Ave.......Buffalo, N. Y.
8 PH	R. C. Husselman, 134 Seneca St......Youngstown, O.
8 PI	J. F. Barton, Main St...................Espy, Pa.
8 PJ	C. S. Taylor, 598 Masten St...........Buffalo, N. Y.
8 PK	J. J. McNevin, 958 College Ave.........Elmira, N. Y.
8 PL	J. Conner, 450 Wellington Ave........Rochester, N. Y.
8 PM	A. M. Martin, 5959 Vermont Ave........Detroit, Mich.
8 PN	E. C. Epsey, 176 Franklin Ave........Vandergrift, Pa.
8 PO	M. Winglemire, 107 Saginaw St..........Holly, Mich.
8 PP	A. Kaeppner, Jr., 236 Sycamore St......Columbus, O.
8 PQ	H. Breitenbach, 39 Vine St............Danville, Pa.
8 PR	C. F. Bramley, 207 Holley St........Brockport, N. Y.
8 PS	R. Barringer, 418 N. Wood St...........Fremont, O.
8 PT	R. Boundy, 56 State St...............Grove City, Pa.
8 PU	H. C. Gitzgerald, Peach & Cherry Sts.......Erie, Pa.
8 PV	R. J. Glass, R.F.D. No. 4........Wellsburg, W. Va.
8 PW	P. J. Wallace, Smith Stop.................Spears, Pa.
8 PX	G. M. Barker, 2901 W. Liberty Ave......Dormont, Pa.
8 PY	R. Palmer, 6050 Northfield Ave.........Detroit, Mich.
8 PZ	J.A.Sullebarger, 1503 Woodbourne Ave..Pittsburgh, Pa.

8 QA	H. L. Lape, 129 Springfield Ave..........Wyoming, O.
8 QB	A. A. Lentz, 203 Moselle St............Buffalo, N. Y.
8 QC	R. C. Emery, 3166 Poplar St..........Grove City, Pa.
8 QD	F. W. Servais, Taylor Ave............Falls Creek, Pa.
8 QE	A. D. Slavin, 2001 St. Paul St.......Rochester, N. Y.
8 QF	R. P. Murphy, 186 Granville St............Newark, O.
8 QG	G. H. Smith, 401 5th St...............Charleroi, Pa.
8 QH	F. A. Hamel, 200 W. Martin Ave..........Amherst, O.
8 QI	A. A. Scheppner, 2514 Peach St............Erie, Pa.
8 QJ	T. H. Mains, 6450 Vinewood Ave........Detroit, Mich.
8 QK	D. E. Schellenbach, 204 Elm St........Wyoming, O.
8 QL	W. T. Smith, 803 Clay St............Sharpsburg, Pa.
8 QM	L. O. Adams, 756 E. Market St.........Elmira, N. Y.
8 QN	F. Collins, 150 Puritan St......Highland Park, Mich.
8 QO	T. R. Parker, 619 Dawson Ave..........Bellevue, Pa.
8 QP	W. F. Ehrick, 218 W. Lucas St...........Bucyrus, O.
8 QQ	R. F. Sadler, 400 Strathmore Rd......Lansing, Mich.
8 QR	T. Peterson, 1001 Madison St........Ludington, Mich.
8 QS	E. L. Ferguson, 1222 W. Ottawa St....Lansing, Mich.
8 QT	E. H. Mitchell, 217 E. Main St..........Findlay, O.
8 QU	J. W. Anderson, Lincoln St., Box No. 155, East Towas, Mich.
8 QV	E. A. Smith, 8819 Hough Ave..........Cleveland, O.
8 QW	C. C. Richardson, 268 Main St........Greenville, Pa.
8 QX	R. R. Schaffner, 149 S. Union St..........Akron, O.
8 QY	R. L. Osborne, 547 McClellan Ave.......Detroit, Mich.
8 QZ	F. H. Garrahan, 393 Northampton St.....Kingston, Pa.

8 RA	M. G. Limb, 151 Beall Ave..............Wooster, O.
8 RB	A. E. Miller, 6811 Clark Ave...........Cleveland, O.
8 RC	M. W. Wetzel, 143 Willowbank Ave.....Bellefonte, Pa.
8 RD	W. H. Smallenberger, 15 William St....Meadville, Pa.
8 RE	R. S. Baker, 41 Steele Ave.........Gloversville, N. Y.
8 RF	E. F. Roberts, Overlook Blvd.........Rochester, Mich.
8 RG	H. L. Bear, Box No. 59, 3rd St..........Freeport, Pa.
8 RH	G. C. Ornstine, 631 Prescott Ave........Scranton, Pa.
8 RI	Reserved.
8 RJ	N. C. Lewis, 2921 Urwiler Ave.........Cincinnati, O.
8 RK	C. J. Emmons, 405 Ohio Ave..............Sidney, O.
8 RL	R. A. Gerhard, 478 N. 1st St...........Leighton, Pa.
8 RM	E. L. Keller, 308 Oakland Ave.........Pittsburgh, Pa.
8 RN	C. F. Lohner, 62 Glendale Ave...........Bedford, O.
8 RO	H. A. Johnston, 3617 Butler St........Pittsburgh, Pa.
8 RP	H.E.Brennan, 2 St. John Pl., 36th St. & Liberty Ave., Pittsburgh, Pa.

8 RQ	R. M. Carson, 150 Wood St	Wilkinsburg, Pa.
8 RR	T. J. Donohee, 841 Franklin Ave	Columbus, O.
8 RS	E. A. Volzer, 1441 Market Ave S	Canton, O.
8 RT	H. W. Whitby, 21 Walnut St	Crafton, Pa.
8 RU	C. C. Rankin, 2929 Glenmore Ave	Pittsburgh, Pa.
8 RV	W. S. Herbster, 622 Industry St	Pittsburgh, Pa.
8 RW	H. Pendleberry, 802 N. Main St	Niles, O.
8 RX	E. A. McDonough, 1232 Braddock Ave	Braddock, Pa.
8 RY	J. H. McQuaide, 298 45th St	Pittsburgh, Pa.
82RZ	K. S. Forsbee, R.F.D. No. 1	Savannah, N. Y.
8 SA	G. G. Moyer, 1417 Cordova Ave	Lakewood, O.
8 SB	W. D. Sanford, 1144 4th Ave	Huntington, W. Va.
8 SC	S. H. Graham, 615 W. Washington St	Ionia, Mich.
8 SD	L. Williams, 248 Tireman Ave	Detroit, Mich.
8 SE	Boy Scouts	Hamilton, O.
8 SF	H. L. Wohlers, 1025 S. Milwaukee St	Jackson, Mich.
8 SG	M. F. McDowell, 612 Mithoff St	Columbus, O.
8 SH	L. A. Taylor, 101 Lyceum St	Geneva, N. Y.
8 SI	C. H. Gebauer, 160 Johnson St	Buffalo, N. Y.
8 SJ	M. F. Bruning, 2842 Mt. Pleasant Ave	Hamilton, O.
8 SK	C. L. Kesecker	Sleepy Creek, W. Va.
8 SL	W. H. Clark, 43 Grove Ave	Highland Park, Mich.
8 SM	C. G. Kaufman, 517 Prescott Ave	Scranton, Pa.
8 SN	R. M. Edmonds, R.F.D. No. 9	Penn Yan, N. Y.
8 SO	K. R. Ling, 413 3rd St	Cresson, Pa.
8 SP	A. Kisner, 809 Coleman Ave	Fairmont, W. Va.
8 SQ	C. D. Morris, 195 N. Liberty St	Delaware, O.
8 SR	L. McCanne, 225 Barrington St	Rochester, N. Y.
8 SS	T. McMahon, Jr., 2944 W. Liberty St	Pittsburgh, Pa.
8 ST	E. C. Wright, 402 Pavey Ave	Columbus, O.
8 SU	R. Hagerty, 5584 Ivanhoe Ave	Detroit, Mich.
8 SV	G. N. Hoyt	Perry, O.
8 SW	K. Taylor, 91 W. 2nd Ave	Columbus, O.
8 SX	C. Carlson, 5814 Stanton Ave	Pittsburgh, Pa.
8 SY	N. Ballbach, 3230 Concord Ave	Detroit, Mich.
8 SZ	W. A. Murphy, 86 Mithoff St	Columbus, O.
8 TA	C. A. Schmidle, Box No. 61, B, Union Rd.,	Ebeneezer, N. Y.
8 TB	C. E. Gardiner, 23 N. Perry St	Johnstown, N. Y.
8 TC	H. E. Batterson, 13 Richard St	Rochester, N. Y.
8 TD	R. W. Pitt, 343 Birr St.	Rochester, N. Y.
8 TE	C. A. Crawford, 1885 E. 90th St	Cleveland, O.
8 TF	W. Atwater, 463 E. 123rd St	Cleveland, O.
8 TG	H. S. Gould, 8520 Brush St	Detroit, Mich.
8 TH	W. B. Jameson, 1019 Rex Ave, N. E.	Canton, O.
8 TI	C. Eckel, 153 Delaware Ave	Detroit, Mich.
8 TJ	J. G. Martin, 12 Innis St	Columbus, O.
8 TK	D. H. Brown, S. Lynn St	Convoy, O.
8 TL	H. C. Loeffler, 2150 St. Paul St	Rochester, N. Y.
8 TM	R. M. Brown, 81 Maple St	Dorranceton, Pa.
8 TN	N. Emmons, 3d, 909 Grand Ave	Dayton, O.
8 TO	H. R. Young, 309 Eldon Ave	Columbus, O.
8 TP	C. B. Marvin, 951 Euclid Ave	Detroit, Mich.
8 TQ	B. A. Norris, 1267 Parkwood Drive	Cleveland, O.
8 TR	D. E. Jenkins, 218 Hyde Park Ave. S	Scranton, Pa.
8 TS	W. B. Lacock	Bethany, W. Va.
8 TT	J. D. Bay, 640 W. Jackson St	Painesville, O.
8 TU	N. A. Otto, 427 6th St	Niagara Falls, N. Y.
8 TV	A. B. Rudenauer, 1646 Elmwood Ave	Lakewood, O.
8 TW	G. Brockman, 522 Riddle Rd.	Cincinnati, O.
8 TX	A. R. Royle, 221 Glenwood Ave	Rochester, N. Y.
8 TY	R. Bissell, 506 Pendergast Ave	Jamestown, N. Y.
8 TZ	F. May, 684 E. Utica St	Buffalo, N. Y.
8 UA	Y. M. C. A. Ass'n, 2231 Carnegie Ave	Cleveland, O.
8 UB	R. B. Harter, 200 W. Main St	Frankfort, N. Y.
8 UC	P. Graeter, 967 McMillan St.	Cincinnati, O.
8 UD	W. Krager	Cattaragus, N. Y.
8 UE	T. D. Seckel, 922 E. Main St	Columbus, O.
8 UF	C. H. Ellis, 292 Jewett Ave	Buffalo, N. Y.
8 UG	T. Quincey, 452 Davison Ave. W	Detroit, Mich.
8 UH	H. C. Robinson, 1751 Northfield Ave	Cleveland, O.
8 UI	H. Stoum, Waverly St	Cattaragus, N. Y.
8 UJ	C. R. Witte, 1182 Leverenz Ave	Detroit, Mich.
8 UK	E. H. Poad, 1509 E. 123rd St	Cleveland, O.
8 UL	H. S. Park, 523 S. Albany St	Ithaca, N. Y.
8 UM	P. D. McFarland, 802 Woodlawn St	Scranton, Pa.
8 UN	H. L. Moerschfelder, Dormitory 6, Carnegie Inst. of Technology,	Pittsburgh, Pa.
8 UP	J. W. Weir, 5590 Pocusset St., Squirrel Hill Station,	Pittsburgh, Pa.
8 UQ	R. W. French, 1675 Pilgrim Pl	Akron, O.
8 UR	V. L. Lathrop, 11 White St	Blissfield, Mich.
8 US	Reserved.	
8 UT	W. A. Somers, 151 E. Main St	Bradford, Pa.
8 UU	J. A. Smith, 41 Seward Ave	Detroit, Mich.
8 UV	H. C. Ehrick, 559 W. 4th St	Mansfield, O.
8 UW	J. C. Bibbins, 307 1st St	Jackson, Mich.
8 UX	D. A. Hoffman, 50 S. Balch St	Akron, O.
8 UY	W. T. Cooke, 242 Forest St	Oberlin, O.
8 UZ	W. G. Biddle, 51 Baltimore St	Dayton, O.
8 VA	J. M. Baxter, 1105 Green St	Marietta, O.
8 VB	W. D. Mathews, Main St	Marlett, Mich.
8 VC	R. Steiner, 5456 Trumbull Ave	Detroit, Mich.
8 VD	E. J. Mossney, 2217 24th St	Detroit, Mich.
8 VE	F. B. Westervelt	Lancaster, Pa.
8 VF	O. W. Barton, 217 Whitney St	Conneaut, O.
8 VG	J. E. Harvey, 1323 Douglass Ave	Youngstown, O.
8 VH	K. B. Lloyd, 251 E. 8th St	Erie, Pa.
8 VI	W.A.Monaghan, Jr., 1437 Woodward Ave.,	Lakewood, O.
8 VJ	E. W. Tarbox, 535 W. Lima St	Findlay, O.
8 VK	J. C. Clark, 89 N. Broadway St	Shelby, O.
8 VL	R. E. Deemer, 2122 W. 53rd St	Cleveland, O.
8 VM	H. M. Rose, 1223 Robbins Ave	Niles, O.
8 VN	E. W. Landon, 1418 W. 45th St	Cleveland, O.
8 VO	U.G.Patterson, 35 E. State St	Gloversvale, N. Y.
8 VP	F. L. Reynolds, 12 Tuxill Sq	Auburn, N. Y.
8 VQ	H. Stewart, Franklin St	Freeport, Pa.
8 VR	J.P.Schaming, 3114 McClurg St. S. S.	Pittsburgh, Pa.
8 VS	E. S. Howe, 2750 Leighton Rd	Cleveland, O.
8 VT	W. A. Sayrs, 239 Helen St., Mt. Auburn,	Cincinnati, O.
8 VU	F. W. Millspaugh, 37 Gaylord St	Binghamton, N. Y.
8 VV	D. Lefevre, 305 Ford Ave	Ogdensburg, N. Y.
8 VW	J. W. Meyer, 1184 College Ave	Elmira, N. Y.
8 VX	E. R. Lappe, 7125 Agnew St	Pittsburgh, Pa.
8 VY	F. M. Louwaert, 1227 N. Burdick St	Kalamazoo, Mich.
8 VZ	E. A. Greene, 15 S. High St	Greenville, Pa.
8 WA	A. B. Allen, 1549 Temple St	Detroit, Mich.
8 WB	G. C. Kostelecky, 11802 Union Ave	Cleveland, O.
8 WC	W. L. Snyder, 402 Ridge St	Curwensville, Pa.
8 WD	H. S. Morris, 1025 Mary St	Parkersburg, W. Va.
8 WE	L. W. Reimsnyder, 310 Woodlawn Ave	Elmira, N. Y.
8 WF	T. R. Wayne, R.F.D. No. 6, Box 14	Bellefontaine, O.
8 WG	E.M.Wilson, Hotel Sherwood, Canisteo St.,	Hornell, N. Y.
8 WH	C. C. Peugeot	Stryker, O.
8 WI	S. Lohmann, 307 W. Main St	Greenville, O.
8 WJ	C. E. Lloyd, 229 E. 5th St	Salem, O.
8 WK	E. A. Wendler, 5939 Canton Ave	Detroit, Mich.
8 WL	H. Webb, 803 W. Riverview St	Dayton, O.
8 WM	G. F. Shuck, 203 W. Pitt St	Bedford, Pa.
8 WN	C. Luebs, 231 Grand Ave., W	Highland Park, Mich.
8 WO	H. Brainard, 836 Richmond Ave	Buffalo, N. Y.
8 WP	R. N. Stoddard, 2134 E. 100th St	Cleveland, O.
8 WQ	A. A. Blash, 409 Davis St	Elmira, N. Y.
8 WR	C. M. Chorpening, 115 W. Church St	Conellsville, Pa.
8 WS	P. Louis, 600 California Ave	Oakmont, Pa.
8 WT	A. J. Sands, 3 William St	Amsterdam, N. Y.
8 WU	E. L. Marts	West Cairo, O.
8 WV	H. B. Hammond, E. Brook Rd	Pittsford, N. Y.
8 WW	J. Fobara, 1506 E. Congress St	Detroit, Mich.
8 WX	N. Ball, 1237 Varland Ave	Toledo, O.
8 WY	D. M. Lord, 531 Beach Ave	Cambridge Springs, O.
8 WZ	H. E. Sticker, 420 Woodlawn Ave	Bucyrus, O.
8 AAB	H. Eck, 113 Front St.	Jamestown, N. Y.
8 AAC	H. M. Ryder, Braddock Rd.	Wilkinsburg, Pa.
8 AAD	J. C. Arns, 801 Wyoming Ave	Lockland, O.
8 AAE	E. W. Zinsmaster, Jr., 5439 Baywood St,	Pittsburgh, Pa.
8 AAF	D. N. Wallace, 1523 Oneida St	Utica, N. Y.
8 AAG	C. A. Long, 516 5th St	Oakmont, Pa.
8 AAH	J. Braschowits, 6516 Clark Ave	Cleveland, O.
8 AAI	G. W. Davis, 403 N. Main St	Coudersport, Pa.
8 AAJ	C. B. Miller, 257 45th St	Pittsburgh, Pa.
8 AAK	F. W. Benskin, 1410 Fulton Rd. N. W.	Canton, O.
8 AAL	J. M. Holshoy, 1427 Homer St. N. W.	Canton, O.
8 AAM	R. H. Koehler, 424 Stokes Ave	Braddock, Pa.
8 AAN	E. Brownell, 321 Cooper St	Utica, N. Y.
8 AAO	L. H. Svoboda, 3622 E. 135th St	Cleveland, O.
8 AAP	T. Glynn, 3315 Broadway Rd	Cleveland, O.
8 AAQ	E. A. Estabrook, 4248 W. 35th St	Cleveland, O.
8 AAR	C. C. Miller, 3589 Beechwood Blvd	Pittsburgh, Pa.
8 AAS	H. Fluke, 370 N. Genesee St	Utica, N. Y.
8 AAT	B. F. Morris, 165 N. Portage Path	Akron, O.
8 AAU	O. J. Cravatt, R.F.D. No. 46, S. Main St.,	
8 AAV	L. E. Clark, Bentley Ave	Hubbard, O.
8 AAW	W. Burston	Farwell, Mich.
8 AAX	C. B. Mullett, 89 Eastwood Pl	Buffalo, N. Y.
8 AAY	H. Heidloff, 5310 McBride Ave	Cleveland, O.
8 AAZ	V. L. Miller, 209 Clarendon Ave	Canton, O.
8 ABA	C. Gerbracht, 223 Sassafras St	Erie, Pa.
8 ABB	E. S. Heck, 31 Lincoln Ave	Salem, O.
8 ABC	O. S. Finch, 1 Stuart St	Binghamton, N. Y.
8 ABD	O. S. Barnes, 215 Main St	Binghamton, N. Y.
8 ABE	R. L. Boyer, R.F.D. No. 11	Sidney, O.
8 ABF	R. Rolfe	Marlett, Mich.
8 ABG	H. A. Wheat, Jr., 584 S. Main St	Geneva, N. Y.
8 ABH	E. V. Barton, 781 Hazelwood Ave	Pittsburgh, Pa.
8 ABI	H. R. Daniels, Jr., 424 W. 1st St	Dayton, O.
8 ABJ	C. M. Sorenson	Dearborn, Mich.
8 ABK	A. E. Johnson, 115 Owen Ave	Detroit, Mich.
8 ABL	T. Whalen, Jr., 119 Amabelle St	Pitsburgh, Pa.
8 ABM	H. L. Spencer, 160 Conklin Ave	Binghamton, N. Y.
8 ABN	J. F. Hamilton, 1132 Jefferson Ave	Buffalo, N. Y.
8 ABO	M. A. Neff, 300 Maple Ave	Birmingham, Mich.
8 ABP	G. M. Bunting, 722 Haven Ave	Ann Harbor, Mich.
8 ABQ	R. A. Eccles, 201 Genesse St	Auburn, N. Y.
8 ABR	G. Rouston, 527 Chalmers Ave	Detroit, Mich.
8 ABS	G. E. Wilcox, 24 Ravine St	Hornell, N. Y.
8 ABT	T. R. Carter, 1722 Whitney Ave	Niagara Falls, N. Y.
8 ABU	H. H. Bradley, R.F.D. No. 5	South Haven, Mich.
8 ABV	R. E. Stowe, 623 Grand Ave	Dayton, O.
8 ABW	M. Vanderweken, 2206 Washington Ave	Scranton, Pa.
8 ABX	P. Coville, 514 E. Buffalo St	Ithaca, N. Y.
8 ABY	C. H. Wagner, 129 Willowbank St	Bellefonte, Pa.
8 ABZ	J. G. Russell, 906 Charles St	Parkersburg, W. Va.
8 ACA	E. L. Green, Booth St	Ashtabula, O.
8 ACB	N. G. Wintermantel, 3028 Stickney St	Toledo, O.
8 ACC	I. E. Beasley, 1874 E. 6th St	Cleveland, O.
8 ACD	H. J. Cooper, R.F.D. No. 5, Box 113,	Slippery Rock, Pa.
8 ACE	W. G. Greavy, 938 Monroe Ave	Scranton, Pa.
8 ACF	T. W. MacNary, 27 Highland Ave	Washington, Pa.
8 ACG	G. H. Hammer, 507 Washington St	Oakmont, Pa.
8 ACH	J. A. Victoreen, 11302 Euclid Ave	Cleveland, O.
8 ACI	F. E. Foster, 226 W. Union St	Athens, O.
8 ACJ	J. Harmon, 714 Literary Rd	Clèveland, O.
8 ACK	N. Arnold, 134 High St	New London, O.
8 ACL	W. L. Parker, 3 Pine St	Binghamton, N. Y.
8 ACM	W. E. Bostwick, 206 Willard Bay	Ithaca, N. Y.
8 ACN	H. E. Wilkinson, 1446 Michigan Ave	Buffalo, N. Y.
8 ACO	P. Robiscung, 1211 N. Edward St	Kalamazoo, Mich.
8 ACP	Hilltop Y. M. C. A., Knoxville Boro, 300 Zara St.,	Pitsburgh, Pa.
8 ACQ	W. B. Louis, 1252 Summit Ave	Lakewood, O.
8 ACR	A. G. Spiller, 14405 Strathmore Ave.	E. Cleveland, O.
8 ACS	D. G. Shotton, 1641 Sanderson Ave	Scranton, Pa.
8 ACT	B. L. Davis, 1435 Velvidere Ave	Detroit, Mich.
8 ACU	H. E. Shults, 319 Young St	Cheboygan, Mich.
8 ACV	C. Davidson, 332 National St	Detroit, Mich.
8 ACW	R. A. Stephens, 181 Seneca St	Hornell, N. Y.
8 ACX	Wilkinsburg High School, 14859 Wallace Ave.,	Wilkinsburg, Pa.
8 ACY	R. C. Wolfe, 912 Blackhoof St	Wapakoneta, O.
8 ACZ	E. W. Brown, 128 Ohio St	Elyria, O.
8 ADA	A. Fischer, 339 Rawson Ave	Freemont, O.
8 ADB	R. Woller, 322 Bird Ave	Buffalo, N. Y.
8 ADC	Raphael Elec. Co., 507 Washington St	Oakmont, Pa.
8 ADD	G. J. Boyle, 72 E. Carey St	Plains, Pa.
8 ADE	E. Beach, 434 S. Grant St	Troy, O.
8 ADF	R. J. McConnell, 931 Beckford Ave	Newcastle, Pa.
8 ADG	C. H. Schrader, 1412 Dudley Ave	Utica, N. Y.
8 ADH	R. K. Strong, 24 Paige St	Owego, N. Y.
8 ADI	M. N. Rohrback, 583 Allegheny Ave	Oakmont, Pa.
8 ADJ	F. J. Brewster, 2159 E. 69th St	Cleveland, O.
8 ADK	C. A. Hultberg, 5432 23rd St	Detroit, Mich.
8 ADL	T. M. Peters, 233 Union St	Bellevue, O.
8 ADM	W. L. Rust, 703 E. State St	Ithaca, N. Y.
8 ADN	J. R. Dean, 86 Vermont St	Rochester, N. Y.
8 ADO	G. W. Hale, Jr., 1852 Rosalind Ave.	E. Cleveland, O.
8 ADP	I. Patchin, 525 Park ave.	Kent, O.
8 ADQ	H. C. Leeds, 821 Ash St	Scranton, Pa.
8 ADR	T. A. Reynolds, 554 East Ave	Medina, N. Y.
8 ADS	R. E. Robb, 203 Murray St	Wapakoneta, O.
8 ADT	H. Mills, 807 Hayes Ave	Fremont, O.
8 ADU	J. A. Sloat, 241 Broadway St	Monticello, N. Y.
8 ADV	R. E. Morley, 713 N. Park St	Kalamazoo, Mich.
8 ADW	J. R. Dauberman, 602 St. Catherine St.,	Lewisburg, Pa.
8 ADX	D. W. Jones, 643 Schuyler Ave	Dorranceton, Pa.
8 ADY	C. C. Davis, 411 Poplar St	Fenton, Mich.
8 ADZ	E. McDonnell, 815 Bancroft St	Lansing, Mich.
8 AEA	B. Gurr, 227 Louisiana Ave	Detroit, Mich.
8 AEB	J. R. Kinnear, 580 E. Lincoln Ave	Ada, O.
8 AEC	H. J. Perkins, 223 Maple St	Elmira, N. Y.
8 AED	E. W. Kiger, Clay St.	Williamstown, W. Va.
8 AEE	J. A. Marien & H. H. Layritz, 2269 Harper St.,	Norwood, O.
8 AEF	G. L. Williamson, 391 Arnett Blvd.	Rochester, N. Y.
8 AEG	E. L. Knapp, 539 Melbourne Ave	Detroit, Mich.
8 AEH	C. W. Mallory, 5764 Hobart St	Detroit, Mich.
8 AEI	F. Doolittle, 41 Broad St	Johnson City, N. Y.
8 AEJ	H. L. Donegan, Main St	Mineral Ridge, O.
8 AEK	H. C. Fullington, 115 Shiloh St.	Mt. Washington, Pa.
8 AEL	C. C. Jenks, 458½ Holden Ave	Detroit, Mich.
8 AEM	C. W. Lucas, 248 Shoemaker Ave	Detroit, Mich.
8 AEN	R. Euchenhofer, 517 Grafton Ave	Dayton, O.
8 AEO	D. A. Gunn, 19 16th St	Buffalo, N. Y.
8 AEP	R. N. Stoddard, 10013 Lamont Ave	Cleveland, O.
8 AEQ	J. D. Anderson & J. H. Patterson, 1608 E. 66th St.,	Cleveland, O.
8 AER	F. H. Rutherford, R.F.D. No. 3	Lancaster, O.
8 AES	A. B. Fuller	Ray Brook, N. Y.
8 AET	W. M. Feuchter, 73 Crescent St	Buffalo, N. Y.
8 AEU	H. S. Brown, 620 Caroline St	Clarksburg, W. Va.
8 AEV	L. E. Krieg, 26 Kent St	Gloversville, N. Y.
8 AEW	H. P. Henkimer, 326 E. 2nd St	Monroe, Mich.
8 AEX	R. L. Doty, 45 South St	Genesee, N. Y.
8 AEY	M. T. McColm, 448 E. Silver St	Lebanon, O.
8 AEZ	F. J. Hooven, 140 Lexington Ave	Dayton, O.
8 AFA	F. P. Keiper, 21 Vick Park Blvd.	Rochester, N. Y.
8 AFB	K. Kemble, 139 Carpenter Rd	Mansfield, O.
8 AFC	C. R. Tanger, R.F.D. No. 5, Box 43	Bellefontaine, O.
8 AFD	N. Beall, 133 School St	Clarksburg, W. Va.
8 AFE	C. H. Daykin, 331 Washington St	Geneva, N. Y.
8 AFF	P. Albert, 476 Sycamore St	Columbus, O.
8 AFG	R. S. Jehard, 816 Himrod Ave	Youngstown, O.
8 AFH	V. McBroom, 427 W. South St	St. Marys, O.
8 AFI	W. E. Nesbitt, 409 1st St	Alpena, Mich.
8 AFJ	J. Monroe, 763 E. Ridgeway St	Cincinnati, O.
8 AFK	H. A. Tieman, 1070 Hancock Ave	Detroit, Mich.
8 AFL	R. M. Smith, 139 McGraw Ave	Detroit, Mich.
8 AFM	J. L. Keir, 4 Dickinson St	Binghamton, N. Y.
8 AFN	R. Russke, 14 Princeton St	Rochester, N. Y.
8 AFO	N. M. Kraus, Cook Ave., Brooklyn Heights Village,	Cleveland, O.
8 AFP	H. J. Rawson, 417 W. River St	Elyria, O.
8 AFQ	W. H. Stanton, Railroad St	Freeville, N. Y.
8 AFR	R. H. Bahney, 516 E. Main St	Massillon, O.
8 AFS	D. Baker, 3205 Gilbert St	Cincinnati, O.
8 AFT	C. E. Helms, 727 Jay St	St. Marys, O.
8 AFU	R. W. Speakman	Conneaut Lake Park, Pa.
8 AFV	T. Gallo	Dubois, Pa.
8 AFW	A. Pulley	Savannah, N. Y.
8 AFX	DeF. E. Rimbach, 628 W. River St	Elyria, O.
8 AFY	D. Stein, 2012 Lawrence Ave	Toledo, O.
8 AFZ	C. C. C. Ragsdale, 146 S. Bryant Ave	Bellevue, O.
8 AGA	J. M. Wescott, 1340 E. High St	Springfield, O.
8 AGB	A. Schulder, 3483 W. 98th St	Cleveland, O.
8 AGC	F. W. Swingle, 18 Alfred St	Binghamton, N. Y.
8 AGD	A. L. Gatwood, 514 S. 9th St	Cambridge, O.
8 AGE	C. A. Harrison, Chestnut Ridge	Lockport, N. Y.
8 AGF	D. R. Inglis, 1025 Baldwin Ave	Ann Arbor, Mich.
8 AGG	Flint High School (by Earl Brockway), 600 Block, Beech St.,	Flint, Mich.
8 AGH	E. L. Parker, 5158 Broadway St	Cleveland, O.
8 AGI	A. R. Stowe, 9418 Clifton Blvd	Cleveland, O.
8 AGJ	C. C. Slocum, 170 Annadale Ave	Akron, O.
8 AGK	N. Schaefer, 32 Broadway St	Lancaster, N. Y.
8 AGL	O. Brazee, 1332 Alexandrine Ave	Detroit, Mich.
8 AGM	J. E. Spencer, 215 E. 156th St	Cleveland, O.
8 AGN	A. T. Sirrine, 46 E. 20th St	Holland, Mich.
8 AGO	B. Arthur, Jr., 3046 Center Ave	Pittsburgh, Pa.
8 AGP	R. T. Searing, 226 Bryant St	N. Tonawanda, N. Y.
8 AGQ	W. H. Keister, 640 9th St	Oakmont, Pa.
8 AGR	F. D. Bliley, 450 W. 9th St	Erie, Pa.
8 AGS	E. A. Weisel, 7944 Michigan Ave	Detroit, Mich.
8 AGT	H. E. Powell, 16319 Nela View Rd.	E. Cleveland, O.
8 AGU	V. W. Hurst, 9 Fairview Heights	Rochester, N. Y.
8 AGV	G. F. Hess, E. Main St	Massillon, O.
8 AGW	G. R. Montgomery, 328 W. Jefferson St	Lansing, Mich.
8 AGX	P. J. Miller, 1133 Creedmore St	Pittsburgh, Pa.
8 AGY	Bellevue High School (by J. C. Amon), Lincoln St.,	Bellevue, Pa.
8 AGZ	C. J. Carter, 1728 Colt Ave	E. Cleveland, O.
8 AHA	V. M. Lucas, 35 Hubbard Ave	Columbus, O.
8 AHB	G. H. Stalker, 123 N. State St	Ann Arbor, Mich.
8 AHC	H. B. Harris, 216 Garfield Ave	Salem, O.
8 AHD	F. Sherwood, 166½ Oak St	Binghamton, N. Y.
8 AHE	M. W. Hopkins, 3125 Peach St	Erie, Pa.
8 AHF	J. A. Lippert, 63 Rose St	Salem, O.

8 AHG L. E. Madison, 240 Center St..........Conneaut, O.
8 AHH F. S. Grandin, 3 Elm St..............Pidionte, Pa.
8 AHI A. Miller, 538 Arden Pl..................Toledo, O.
8 AHJ J. C. McIlwaine, 96 Broad St.......Plattsburg, N. Y.
8 AHK G. H. Hall, 22 Buena Pl............Rochester, N. Y.
8 AHL H. W. Butler, Plum St..............Bolivar, N. Y.
8 AHM C. M. Decker, 43 Adams St..........Rochester, N. Y.
8 AHN R. McCaffrey, 138 Avondale Ave.......Jackson, Mich.
8 AHO R. Austin, 33 Sterling Ave............Detroit, Mich.
8 AHP R. M. Pfluke, 255 Pinnacle Rd.......Rochester, N. Y.
8 AHQ M. H. Preums, 53 McKinley Ave......Kenmore, N. Y.
8 AHR E. Koch, 304 Paulson Ave............Pittsburgh, Pa.
8 AHS M. H. Cotton, 54 Cornell Ave........Kenmore, N. Y.
8 AHT C. F. Parcels, 140 Carbon St.............Toledo, O.
8 AHU P. Kolb, 62 Brandon Pl...........Williamsport, Pa.
8 AHV M. G. Clock, 1237 E. 100th St.........Cleveland, O.
8 AHW L. W. Schollenberger, 602 N. 2nd St....Pottsville, Pa.
8 AHX C. L. Wright 1946 Hopkins Ave. ......Norwood, O.
8 AHY A. R. Harvey, 511 Yankee Rd.........Middletown, O.
8 AHZ D. Bear, Jr., 5519 Bartlett St., Squirrel Hill, Pittsburgh, Pa.

8 AIA F. Schiestel, 9399 Richter St..........Detroit, Mich.
8 AIB C. J. Fertick, 62 Vincent St..............Dayton, O.
8 AIC V. T. Seaman, 245 Washington St......Bay City, Mich.
8 AID P. Blake, 634 Huron St............Cheboygan, Mich.
8 AIE L. E. Flagg, 158 Anderson Pl..........Buffalo, N. Y.
8 AIF S. Feltz, 290 Beaver St.................Akron, O.
8 AIG W. C. Schmeser, 75 Amada Ave., Mt. Oliver, Pittsburgh, Pa.
8 AIH W. L. Horner, 423 Green St...........Greenburg, Pa.
8 AII R. C. Zollitsch, 17 Viola Park ....Buffalo, N. Y.
8 AIJ H. E. Sundberg, 783 7th St...........Buffalo, N. Y.
8 AIK F. Pickel, 164 Pingree Ave...........Detroit, Mich.
8 AIL S. W. Seeley, Grand River Ave.......E. Lansing, Mich.
8 AIM E. P. Getter, R.F.D. No. 8, Belmont......Dayton, O.
8 AIN R. J. Parker, 164 Church St..........Buffalo, N. Y.
8 AIO C. W. Dalzell, 212 Spring Ave......E. Pittsburgh, Pa.
8 AIP C. B. Johnson, 1526 Quarrier St....Charleston, W. Va.
8 AIQ R. Slusher, 612 W. Pearl St..........Wapakoneta, O.
8 AIR E. Field, 10305 Olivet Ave............Cleveland, O.
8 AIS H. C. Baldwin, 14 Odell St...........Union City, Pa.
8 AIT G. S. Solomon, Main St.................W. Cairo, O.
8 AIU R. Austin, 538 Park Pl..................Elyria, O.
8 AIV B. J. Nelson, 408 Otwell Way..........Pittsburgh, Pa.
8 AIW S. Stevens, 416 Railroad St..........Bloomsburg, Pa.
8 AIX G. D. Bauer, 6 Wilmer St............Rochester, N. Y.
8 AIY P. O. Simcox, 705 Clark St............Cambridge, O.
8 AIZ H. T. Smith, 123 Springfield Park.......Wyoming, O.

8 AJA J. McGoldrick, 1025 Blair Ave..........Scranton, Pa.
8 AJB L. G. Ward, 519 M. Mantna St...............Kent, O.
8 AJC S. R. Hawley, 2401 Maplewood Ave..........Toledo, O.
8 AJD F. E. Holcomb, 30 Burns St............Wyoming, O.
8 AJD N. J. Bukey, 430 S. Sandusky St........Delaware, O.
8 AJE A. C. Penfield ....Conneautville, O.
8 AJG H. R. Susemihl, 529 Pennsylvania Ave....Elmira, N. Y.
8 AJH W. Walker, Box 113 ....Marlette, Mich.
8 AJI V. H. Vance, R. F. D. No. 1, c|o Mrs. H. J. Britt, Bedford, O.
8 AJJ O. C. Thompson, 3252 Kimball Ave.........Toledo, O.
8 AJK J. A. Ulmer, 208 S. Walnut St..........Bucyrus, O.
8 AJL J. D. Marsh, 562 Mentor Ave..........Painesville, O.
8 AJM P. N. Elving, 1238 Sunday St., N. S...Pittsburgh, Pa.
8 AJN S. F. Kruper, Amyville P. O...........Gratztown, Pa.
8 AJO T. B. Keller, 1362 W. 76th St.........Cleveland, O.
8 AJP E. End Y.M.C.A., 2053 105th St......Cleveland, O.
8 AJQ D. K. Auck, 141 W. 11th Ave..........Columbus, O.
8 AJR H. Clark, 307 Huntington Ave..........Buffalo, N. Y.
8 AJS G. A. Walde, 233 S. Union St.............Salem, O.
8 AJT H. C. Barton, 18 Myrtle St..............LeRoy N. Y.
8 AJU W. B. Wines, 1208 Hill St........Ann Arbor, Mich.
8 AJV F. Kucklick, 622 Vine St.............Coshocton, O.
8 AJW C. F. C. Sarver, Jr., 3280 Orleans St...Pittsburgh, Pa.
8 AJX I. M. Chambers, 37 Montrose Ave........Delaware, O.
8 AJY E. A. Musser, 711 Pearl St..........Wapakoneta, O.
8 AJZ L. Karnock, 2759 McCurdy Ave.........Cleveland, O.

8 AKA C. F. Woese, 802 McBride St.......Syracuse, N. Y.
8 AKB A. Morrell, 139 Prospect St........Gloversville, N. Y.
8 AKC J. D. Kissinger, 1999 N. 4th St........Columbus, O.
8 AKD A. Harper, R.F.D. No. 1......................Niles, O.
8 AKE C. F. Engler, 319 Ellis Ave.............Bellevue, O.
8 AKF H. E. Fitch, 219 W. Church St.........Elmira, N. Y.
8 AKG H. W. Lewton, 3457 47th St. W........Cleveland, O.
8 AKH P. T. Criswell, 107 Farragut St......Vandergrift, Pa.
8 AKI W. K. Aughenbaugh, 630 Franklin St...Johnstown, Pa.
8 AKJ C. G. Chapel, 430 Almyra Ave.........Youngstown, O.
8 AKK F. N. Kryssewski, 1319 North St.....Rochester, N. Y.
8 AKL M. A. Spear, 539 Wheeler Ave..........Scranton, Pa.
8 AKM G. P. Jones, Jr., 26 Elm St.............LeRoy, N. Y.
8 AKN S. H. Graham, 559 Cyrus St............Ionia, Mich.
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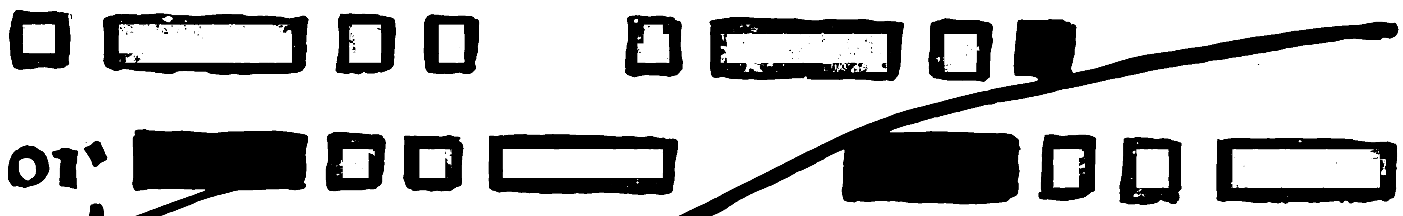
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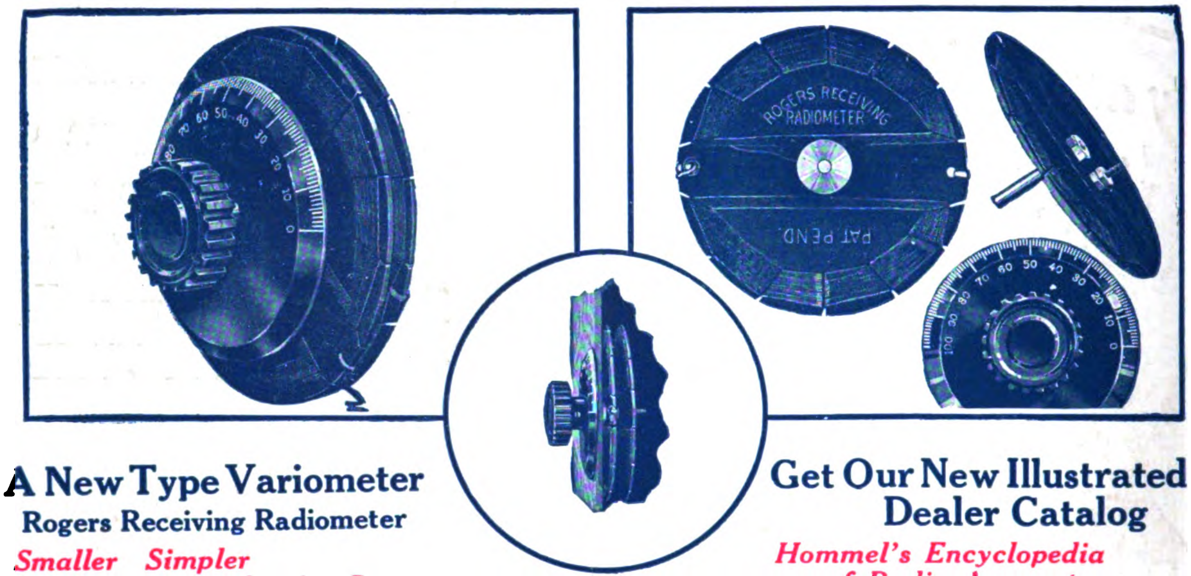

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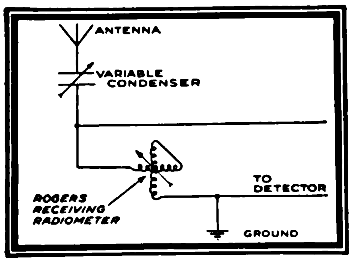

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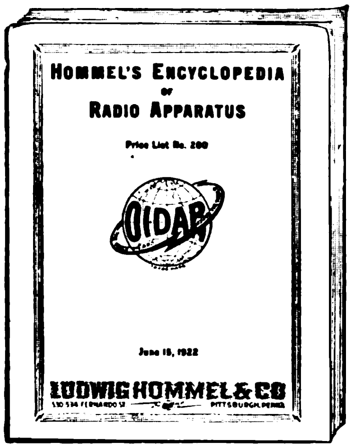

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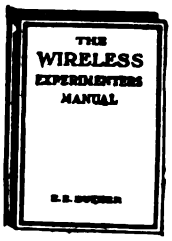

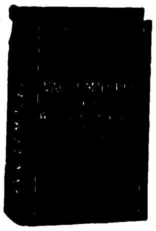

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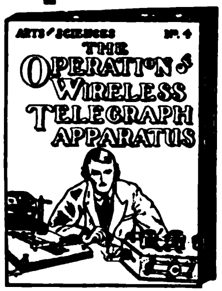

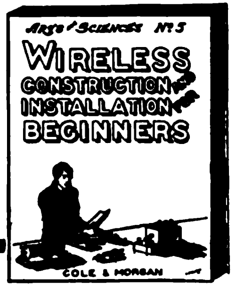

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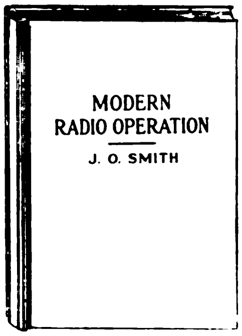

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Practically all amateurs in America and many abroad have heard 2ZL and wondered how he gets his marvelous results. Those who have been privileged to go over this station, owned and operated by J. O. Smith, at Valley Stream, Long Island, have understood how the utterly unprecedented accomplishments of this station have been possible and have been able to secure greater efficiency from their own installations by operating them according to the principles used at 2ZL.

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3. Typical High Power Broadcasting Stations.
4. Receiving Equipment for All Purposes and Its Operation.
5. Spark vs. Continuous Wave Transmission.
6. Vacuum Tube Fundamentals.
7. Operating Characteristics of Vacuum Tubes.
8. Methods of Obtaining Plate Potentials, and Types of Continuous Wave Transmitters.
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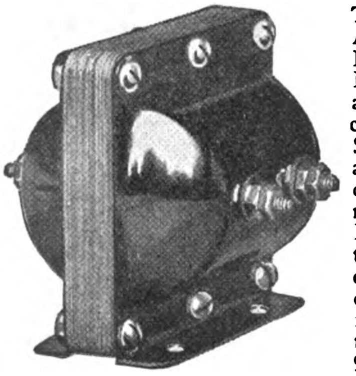

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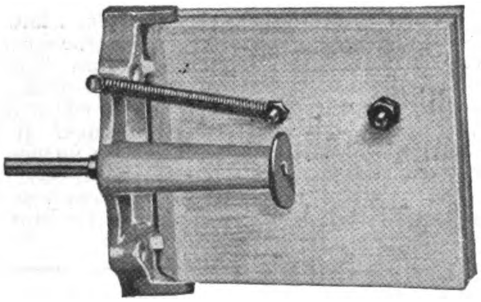

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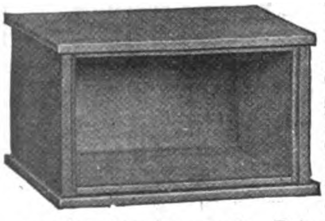

We manufacture a full line of cabinets in gum, mahogany or quartered oak, and furnish them with genuine formica panels. Prices on cabinets range from $2.50 to $10.50.

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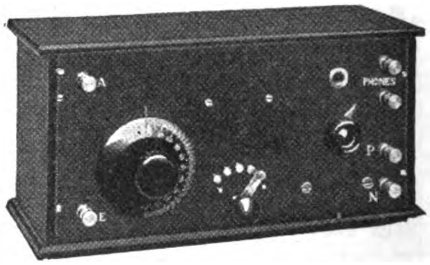

This instrument is a combination tuner and audion detector, and was developed to supply the demand for a low priced efficient receiving outfit with a range of 150 to over 600 meters. The hookup is special—of our own design and is non-regenerative. New Jersey, Pittsburgh, Detroit and other phones are regularly copied in Cincinnati and other points, with this receiver. The HARKO SENIOR is 11¼ inches wide, 6 inches high, and 4⅞ inches deep. Price, complete without "B" Battery, "A" Battery or phones—$20.00.

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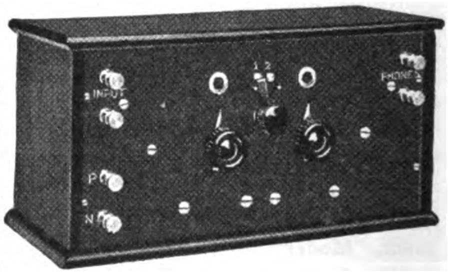

This instrument was designed to give the very maximum in value and to match up with the Harko Senior, using the same sized cabinet. Complete with amplifying transformers, sockets, rheostat, switch, binding posts, etc., mounted on formica panel in mahogany finished cabinet. This efficient instrument can also be used with any other apparatus requiring two step amplifier. Price, complete as shown in illustration—$25.00.

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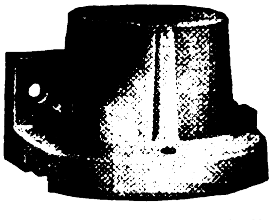

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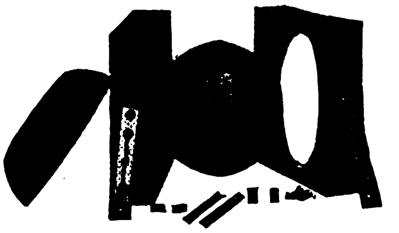
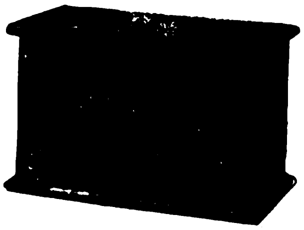


Consist of two stators, one rotor and the necessary hardware as shown in the illustration for complete assembling. Shaft for knob and dial is 3/16" diameter. Wood parts are furnished either in mahogany or poplar.

Price, complete, made of poplar wood	$1.50
Price, complete, made of mahogany wood	$1.75

Harko Radio Receiver



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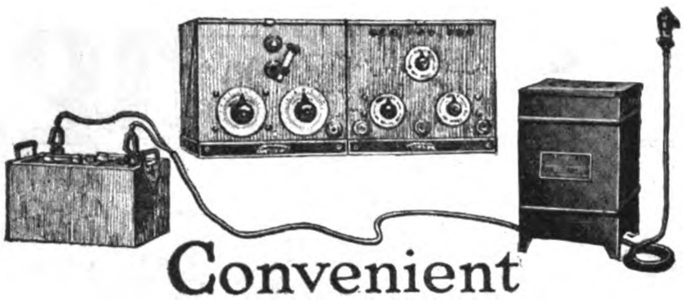

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See Page 3 for a full description of the book

Modern Radio Operation

by

J. O. Smith

we told you about in this space last month. This book is worth your while

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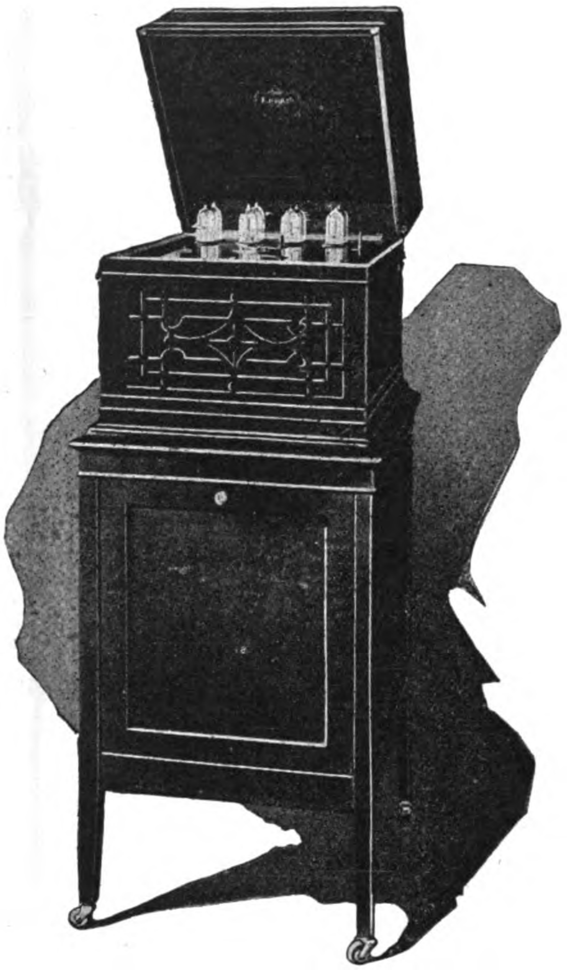
For this Broadcasting Receiver thousands have been waiting



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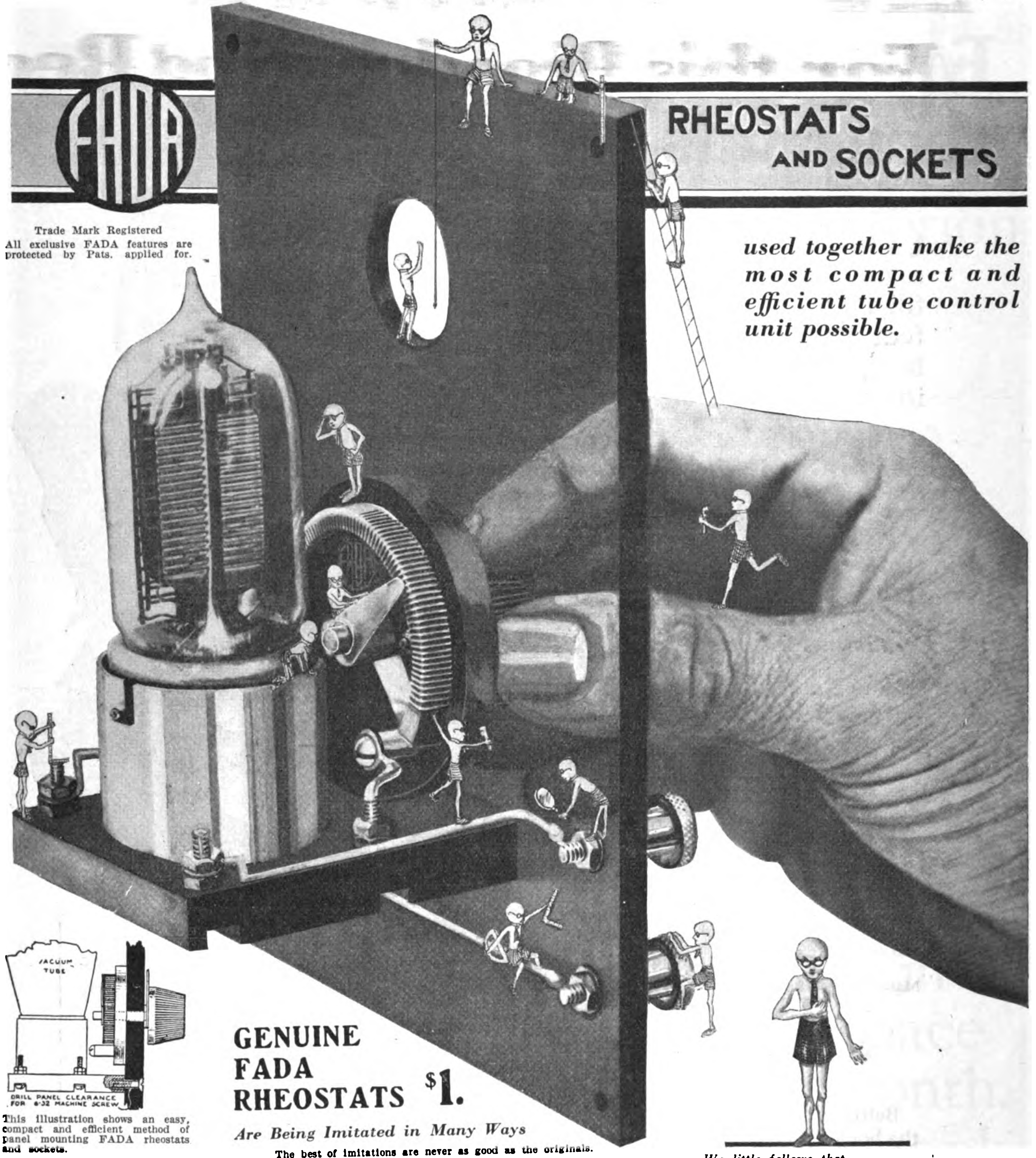
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The best of imitations are never as good as the originals.

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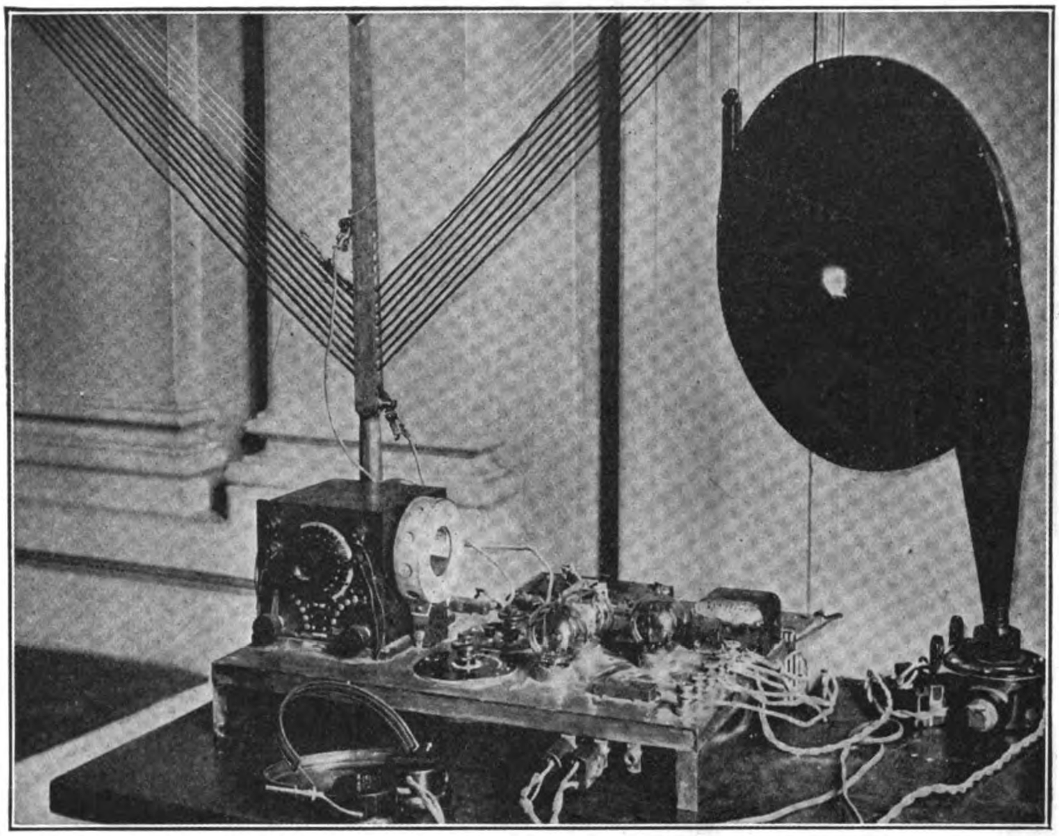
We think that our work should be recognized, and we want a name that fits. Over in our safe keeping place we have a beautiful two-stage amplifier that we will give to the person that suggests the name that we think most appropriate. Contest closes September 15. If more than one person suggests the winning name, duplicate awards will be given to each.

F. A. D. ANDREA

1581-C JEROME AVE., NEW YORK CITY

Armstrong Uses Pacent Radio Essentials in His New Super-Regenerative Circuit



Pacentized Equipment used by Major Armstrong to demonstrate his super-regenerative circuit before the Institute of Radio Engineers

WHEN Major Edwin H. Armstrong recently demonstrated his new super-regenerative receiver before the Institute of Radio Engineers, he was able to receive from the famous W J Z station at Newark (25 miles distant) by the use of three vacuum tubes, although only a small loop aerial was used in the steel framed building of the Engineering Societies, New York City. The program was reproduced with such great volume that it filled the lecture hall and corridors.

In his precision radio work, Major Armstrong chose his equipment with the greatest care and with a keen sense of engineering values. PACENT Radio essentials were selected by Major Armstrong because they were of correct design and constructed with honest materials.

ARMSTRONG CHOSE

PACENT DUO-LATERAL COILS, as the best suitable inductances for the auxiliary frequency circuits. Duo-Lateral Coils are the last word in inductances.

PACENT UNIVERSAL PLUG, because of the perfect, constant contact they produce, which is absolutely essential in any radio receivers employing extremely high amplification.

PACENT MULTIJACKS, because, aided by the Pacent Universal Plugs, they allow him to make perfect contacts and to rapidly change connections.

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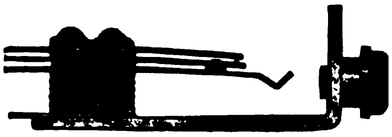
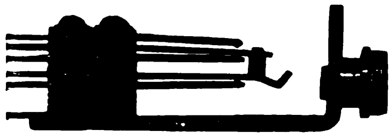

No. 1435-W—FILAMENT CONTROL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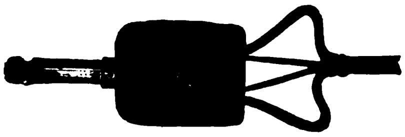
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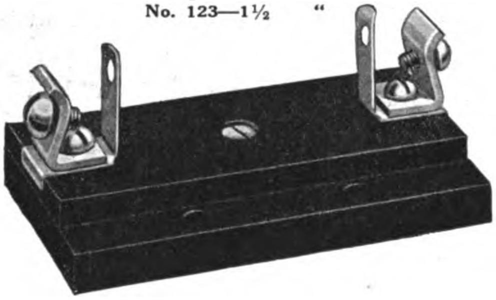
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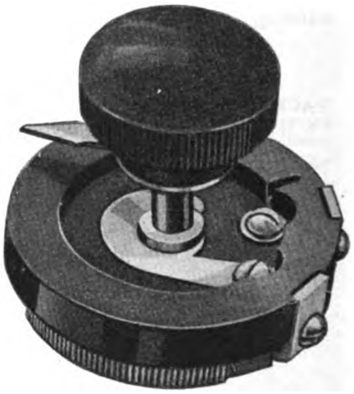
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—hardwood box, mahogany finish
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—rubber feet protect the table
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No. 6860— 90 Amp. Hrs.—45 Lbs.—$18.00
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Eveready "B" Battery No. 766
Equipped with 5 positive voltage taps ranging from 16½ to 22½ volts. Fahnestock Spring Clip Binding Posts—an exclusive Eveready feature. Price $3.00

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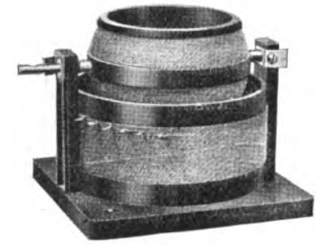
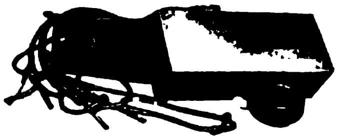


Radisco Variocoupler

Positive contact assured by phosphor bronze brushes at each bearing. Wire is insulated. Wave length range with suitable condensers, 150 to 700 meters. $6.00.



Phonoscope

Extra headphones are unnecessary. The phonoscope permits four people to "listen in." Does not cause distortion. Only $5.00.

Pocket Receiver

The most convenient small set. Fits the coat pocket. Range 30 miles—permits sharp tuning. Only $5.00.

Clamping the jinx on lightning pranks

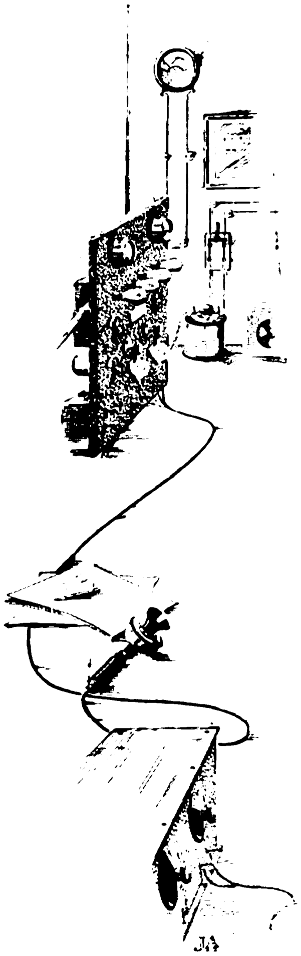
NIGHT and a storm—the sky's aflame. Now's the time you're glad you had the forethought to buy a Radisco Lightning Arrester for your radio set. Without it the high induced charges always present in your antenna during an electrical storm can ruin the delicate instruments.

With the Radisco Lightning Arrester installed on your antenna wire you clamp the jinx on lightning's pranks. The Radisco continually side-tracks these high induced charges (caused by lightning in your neighborhood) before they can harm your set.

Neat, inexpensive. Outside type $3. or the inside type for $2.50 at your dealer's or mailed direct. Ask also for our special summer catalog of radio supplies. You will find the best in many types of radio products listed for your convenience. Get it now while the supply lasts. The Radio Distributing Company, Newark, New Jersey.

RADISCO
LIGHTNING ARRESTER

In Our Opinion



Emergency Equipment for Aircraft

THE loss at sea off the Florida coast recently of the big passenger-carrying seaplane Miss Miami after a forced descent, with a toll of four lives, and the death of the French General Laperine by thirst and exhaustion in the Great Sahara Desert, after a forced descent of his airplane, brings out clearly in two extremes the peril to which travelers in heavier than air machines may be subjected and the consequent necessity for emergency radio equipment on planes of all types.

General Laperine setting out to fly across the Great Sahara was forced to make a landing in the desert, and wandered around until death from exhaustion, thirst and hunger overtook him. His plane was equipped with radio, but no signals were received from him by fixed radio stations well within range of his transmitter, for the interval of time between when the trouble in the plane first developed and when the craft actually landed was not sufficient to transmit a call. This tragedy emphasizes the inadequacy of the standard form of radio installation, in which the air-driven generator and trailing antenna are useless for transmitting purposes, once the plane has landed.

The case of the Miss Miami discloses gross carelessness, for this was a commercial seaplane plying between Miami and the Island of Bimini, off the eastern Florida coast. A forced descent when fifteen miles from the island because of a broken propeller, brought the frail craft down to a rough sea; then a storm came up, but for two days and nights the four passengers clung to the plane until one by one they succumbed to exhaustion and died, their bodies being washed overboard and lost. The wreck was finally sighted by a passing steamship and the pilot, more nearly dead than alive, was rescued.

The provision of reliable emergency radio sets on planes of various types has often been discussed by engineers but no acceptable method of furnishing primary power has yet been found. Storage batteries, small gasoline engines and hand-driven generators have been principally objected to because of weight. The antenna problem, however, is less serious, for an antenna fixed to the wings of the plane has been found to be serviceable over short distances and the Navy Department has conducted successful experiments with emergency antennas flown by kites.

Congress might well emulate the example of the British House of Parliament, which announced recently that regulations would soon be issued requiring that all British aircraft must be equipped with radio. American aircraft operating in commercial passenger-carrying traffic should protect the lives of pilots and passengers and should be required to install not only radio equipment for ordinary communication purposes, but emergency equipment as well.

Location of Radio Stations

THE tests of radio transmission and reception made recently between a moving train on the Lackawanna Railroad and several fixed stations along the route confirmed practically all previous theories with regard to the location of a station in relation to surrounding objects. Very little difference could be detected in received signals between the times the train was running on an open stretch of track or through cuts 30 to 40 feet deep. Signal strength increased noticeably, however, while the train was passing lakes, and even in greater degree when the run was over a high embankment. Whenever the train passed through heavily wooded country, the signals faded out entirely.

These tests clearly indicate that a station erected in open country, preferably on an elevation and clear of trees and other growth, will do better work than one in a valley or surrounded by trees.

* * *

The Propaganda of Fear

EVERY so often we hear of another revision of the Fire Underwriters' rules and regulations, coupled with warnings that radio fans must conform strictly to the "revised" code or face an increase in premium rates or refusal of insurance altogether.

Our valued contemporary, Electrical Merchandising, terms this the "Blight of the Underwriters," and observes:

"An ordinary radio receiving set, as every reader knows, involves about as much fire hazard as a white enamel bath tub."

It is advanced that even the authors of the underwriters' new rules freely admit that antennas installed wholly inside of buildings represent no fire hazard whatever—that any existent hazard lies in lightning striking the antenna that extends outside of the building.

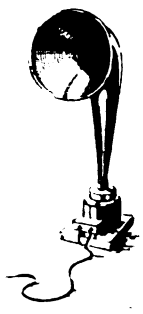
"And how much lightning hazard is that?" is asked. With the answer: "Isn't the lightning, or fire hazard, of an antenna extending outside a dwelling or other structure, only comparable to the lightning or fire hazard of many familiar structures such as gutters, leaders, metal roofs, metal clotheslines—as much and no more?"

Lightning strikes literally only about one house in a million, so the hazard is an extremely small one, no greater than if the antenna did not exist. Fire underwriters nor anyone else has yet demonstrated, nor proven conclusively, that even an outdoor antenna is extra hazardous.

The restrictions are becoming absurd, and it is about time for the army of radio enthusiasts to take a firm stand against unreasonable requirements.

Any proposed campaign of cancellation of insurance policies might well begin with the indoor wiring of houses and other buildings throughout the country, a large percentage of which probably contain violations of the existing code. But any attempt to cancel insurance against all violations either of antennas, or the regular indoor wiring, would come pretty close to demoralizing the insurance business, so it is not expected that any such thing will be attempted.

Yet it is undeniable that "propaganda of fear" carried on against radio has accomplished only one thing—restriction of the radio industry. Having no justification, it should be abandoned at once.



Kouns Sisters Are Real Friends of Radio Public

NELLIE AND SARA KOUNS believed Guglielmo Marconi when, in 1914, he told them that some day they would sing to hundreds of thousands by the radio telephone. The prophecy and how it came true is told on page 33

Radio Her Medium for Instruction in Graphi

TO this talented young car
and actress, Ruth Ha
first came the idea of teaching
via the radio telephone. On
appears her first broadcast less
her own instructive illustrations

"Howdy, Radio Fans," Says Comedian Eddie Cantor

WHEN Eddie Cantor spoke into the homes of the radio audience, his mail next day contained dimes, nickels, pfennigs, Austrian kronen and buttons. The article on page 39 tells how it happened and who got the collections

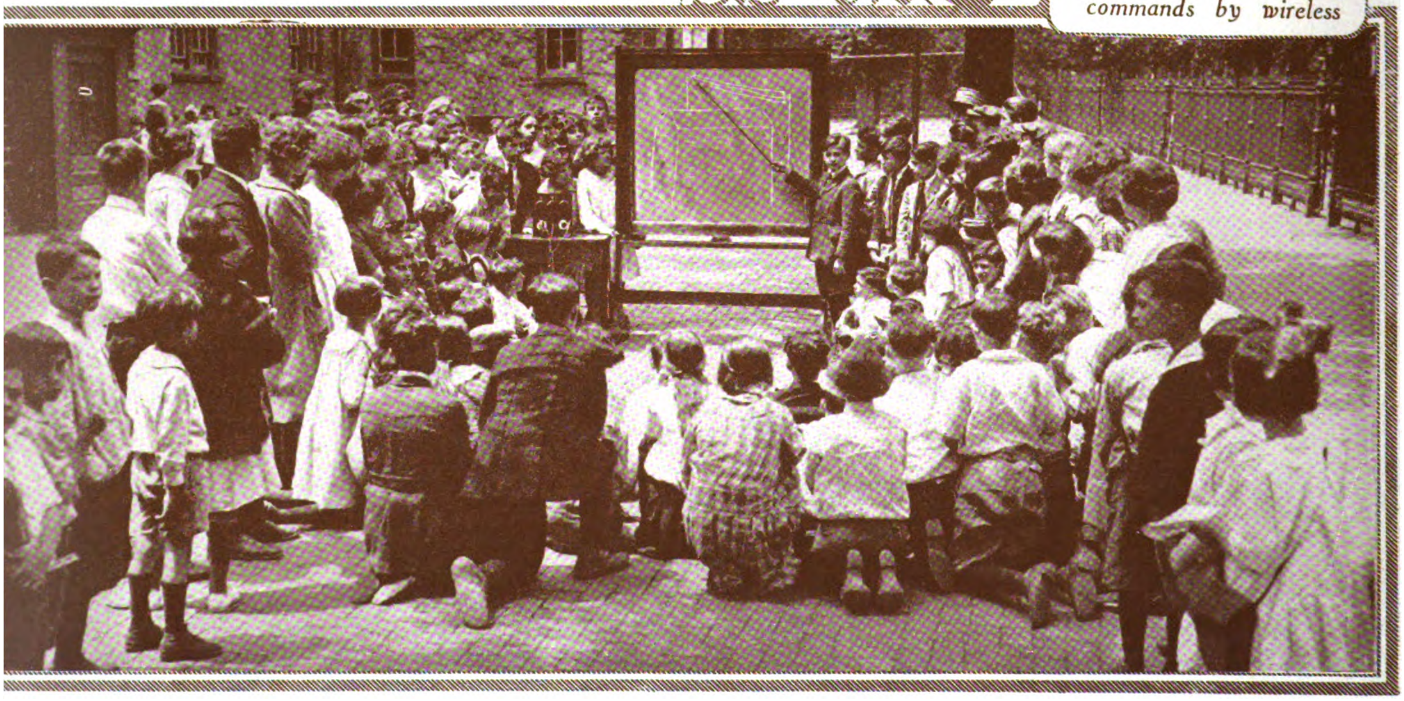
Noted Pianiste Pays Radio a Deep Compliment

CAROLYN BEEBE, founder of the New York Chamber Music Society, considers that the radio telephone is aiding her in developing public appreciation of the best music. Her broadcasting experiences, told on page 47, proved this to her

hildren Prove Age Is No Bar in Radio Work

Jackie Coogan listens over the radio telephone to the broadcasting of the new song "Oliver Twist," written around his latest motion picture of that name

These students of the Lane Technical High School, Chicago, demonstrated radio telephone direction of military movements at their annual review, receiving commands by wireless



Philadelphia's reputation for sleepiness may or may not have been earned in the past, but if the new generation lives up to its present speed all somnolence soon will be banished there. William Noble Allen is the present leader of the sleep-banishers, for despite his 11 years he is a licensed radio operator and conducts instruction classes for school children and adults, as shown above. William is looked upon as a youthful code speed king, being expert in both practice and theory

Nation Honored by Visit of Guglielmo Marconi

Senatore Marconi aboard his yacht "Elettra" immediately upon arrival in New York City late last June

He is shown here with Owen D. Young (left) and E. J. Nally, chairman and president respectively of the Radio Corporation of America

Mr. Marconi and Roy Weagant, famous expert in static elimination, standing in front of Alexanderson alternator at Radio Central, the Radio Corporation Station on Long Island

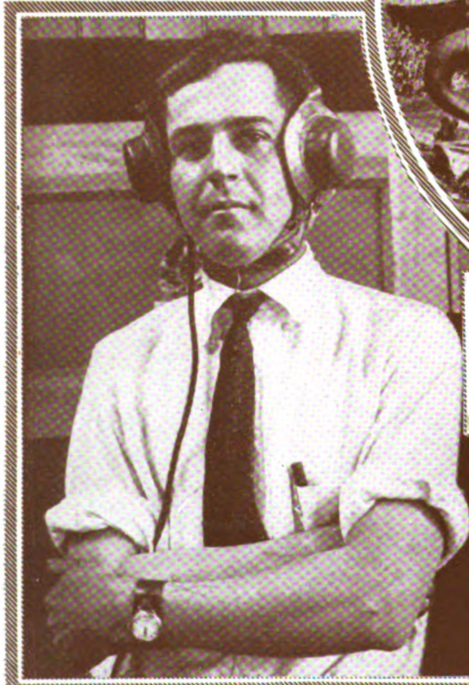
Before Marconi's departure for his home in Italy the photographer caught this interesting study of the wireless wizard in his element aboard his yacht

Radio Telephone Serves Well in Work and Play

An enterprising London, England, hairdresser provides her patrons with a permanent wave and radio waves at the same time

Chief Little Bear says "Radio Heap Good" and beats time with his tomtom as he listens to a broadcast concert in Chicago

Major Cleghorn, British war veteran, takes his radio set along when vacationing along England's by-ways in his completely fitted bungalow on wheels



This experimenter has worked out a transmitting microphone that he straps under his chin, where it catches the voice vibrations much as does an ordinary telephone when placed against the chest

If spiritualistic mediums are frauds, the Kymograph, operated by Dr. Hereward Carrington, its inventor, will show the imposition. It automatically distinguishes between voluntary and involuntary acts

Radio Music Charms Stage and Screen Beauties

For instance, Priscilla Dean at Universal City, Cal., finds time, even while in costume, to listen in on the radio

And Marion Merle, of vaudeville, at times places the phones about the ears of her trained and wondering parrots

While during a delay in street traffic, Corinne Griffith tunes in with her portable radio set and in her auto catches anything that may be in the air—concerts, news, lectures, etc.

"Radio, Page Mr. Brown!"

RADIO amplifying equipment, such as is used in many amateur receiving sets, is being used by the Hotel Essex, Boston, Mass., to replace the time-honored paging system. When requested to "page Mr. Brown" the telephone operator merely turns to a paging transmitter at her elbow and says, "Mr. Brown, please, Misterrr Brrownn." And Mr. Brown, if he is in the lobby, hears the call from loud speakers located at suitable points.

Radio in Community House

RADIO instruments have become part of the essential equipment of community houses, being classed with the motion picture projector, the bowling alley, the basketball court and the showers. Such, at least is the opinion of the B'nai B'rith Congregation of Los Angeles, Cal., which is erecting a new synagogue and community house. The latter will have a complete radio set.

W J Z Gives Ships' Positions

A NEW and much-appreciated addition to the regular features of the program at WJZ, Newark, N. J., is the announcement of the positions of ships. Information as to the location of various vessels is secured from the Radio Corporation of America and given daily over the radio telephone at 8 p. m. The ships are described as being so many miles in a certain direction from various light ships, in most cases, as, "350 miles east of Ambrose Light Ship." This is especially liked by those of the radio audience who have relatives, friends or cargoes on the ships named.

Post-Office Official Station

COMMENCING July 1st Station WYX of the Post Office at Washington, D. C., began to broadcast by the radio telephone on 1160 meters, so that all may get the latest weather, crop and market news without knowing code.

The daily schedule, except for Saturday, when the station closes at 1 p. m., is as follows:

10:00 a. m. Weather (Eastern-Central only).
10:30 a. m. Washington wholesale fruits and vegetables.
12:30 p. m. Live stock, opening St. Louis and Chicago (form 41).
2:15 p. m. Chicago and St. Louis live stock closing (form 20).
3:00 p. m. Crop report and special market news.
3:30 p. m. General fruits and vegetables.
5:00 p. m. Wholesale dairy produce, New York and Chicago (form 59).
5:30 p. m. Grain report.
7:30 p. m. Live stock and grain (form 43).
8:00 p. m. Fruits and vegetables.
9:30 p. m. Weather.

Campfire Concert Broadcast

CAMP CURRY in Yosemite Valley, known for its campfire concerts, desired to "tell the world" about them and so selected the modern means of radio telephony.

The entertainers made the trip to Stockton and from the Stockton Record broadcasting station of the Portable Wireless Telephone Company sent out a concert exactly as held each evening beside the campfire at Camp Curry in the Yosemite.

Radio to Aid Babies

JUDGE Gustave Hartman of New York City, who is president of the Israel Orphan Asylum made a radio appeal recently from WJZ for funds to rebuild a home for 200 orphan babies, made homeless by the recent disastrous Arverne fire.

Finds Jobs by Radio

BY MEANS of the Navy's radio broadcasting station at Anacostia, NOF, the Veterans' Bureau Employment Service is broadcasting to veteran radio fans opportunities for employment, and is also broadcasting the names, for the benefit of prospective employers, of "Vets" skilled in various trades and professions who are in search of employment.

The first "Radio Want Ads" which went out, brought several replies. The broadcasting is a part of the Bureau's plan to establish national and departmental clearing houses for social, industrial and professional employment. Officials of the Bureau believe that with radio they are getting into closer touch with both the Veterans and the employers, as they reach the family circle in an even more personal way than through the newspapers.

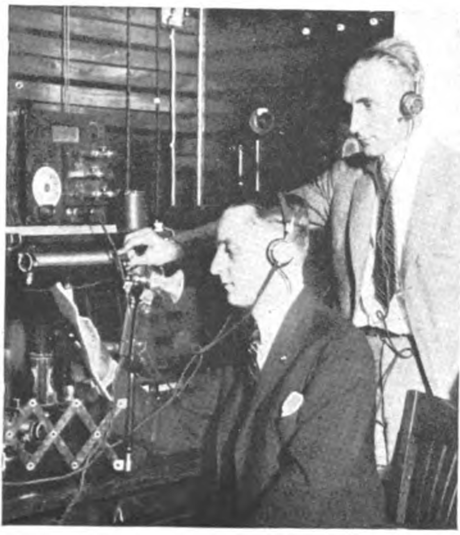


Photo shows Dr. Rogers (seated) of the Veterans' Bureau broadcasting a list of vacancies for former service men

Mars Still Silent to Marconi and the Earth

THE newspaper stories about Marconi's messages from Mars still lack confirmation from the famous radio expert, who declared on his recent arrival in this country that talk of his having received signals from Mars was "bosh." Among radio experts generally there is considerable doubt as to whether inter-planetary communication ever will be possible, for each planet is in effect a vast magnet, within the field of which radio signals travel, and from which it probably would be impossible for them to escape.

Mars for years has been a fertile source of conjecture. When Dr. Otto Klotz, director of the Dominion Observatory, returned to Canada recently from Europe he told ship news reporters that he would say nothing about communicating with Mars.

"Don't ask me to comment on Mars," he said. "Years ago we had a town planning campaign in Canada and a number of us wrote on various topics, all of which we had hoped would contribute to the gaiety of the occasion. I wrote about Mars and my screed was in the nature of a communication from the planet telling us that we were all wrong about laying out towns and about our mode of life.

"I remember that Mars had a method of making a superior brand of liquor and the best of beer was made over night from a preparation sold in the department stores of Mars. Well, some of the papers took the thing seriously and I heard from that story from all parts of the world. Some of the papers caught the spirit of the josh and kidded back on it, but a lot of them took it seriously and handed me back a fine stream of sarcasm. I was kidded, joked, jabbed, guyed and held up to scorn and for more than a year didn't know what peace of mind was. You will excuse me if I refrain from being quoted on anything that has anything to do with Mars."

Broadcasts Illustrated Talk

THE familiar habit of the lecturer who says "Next picture, please," made it possible for Ralph Hayes Hamilton to broadcast his illustrated lecture on the Yellowstone National Park, from the Rike Kumler station in Dayton, O. Mr. Hamilton distributed sets of his stereopticon slides to various churches and other organizations within the range of the station. The slides were arranged in proper order, and each separate audience, as it listened to Mr. Hamilton's words issuing from a loud speaker, was able to view on its own screen the appropriate picture.

J. Andrew White speaking at the ringside to the radio audience

Radio Telephone Gives Public Vivid Description of

Leonard-Britton Bout

Broadcasting of Championship Boxing Match Thrills Hundreds of Thousands

By Maurice Henle

WHEN the last gong had sounded, and the referee had announced the defeat of Benny Leonard by Jack Britton on a foul in the recent championship bout at the New York Velodrome, boxing fans within the immense open-air arena poured from the exits and scattered to their homes, the telegraphers snapped shut their keys and hurried away with the newspaper men. The special policemen, ushers, and helpers departed, the last man switched off the lights—and there was darkness. The contest was over.

That is what happened within the grounds where the classic contest was staged, but the true story of that championship match cannot be limited to the board fence encircling the stands.

Because for the first time in ring history the blow-by-blow results of a championship match were sent out from the ringside by wireless telephone direct to more than 250,000 listeners within a radius of as much as 800 miles. The greater part of this audience was packed within the states of New York, Connecticut, New Jersey, Pennsylvania and Delaware, although people as far west as Indiana and Ohio and north to Nova Scotia, heard the results.

So that in reality, at the same time the lights were being switched off at the New York Velodrome and the gates were being closed, a quarter million individuals scattered here, there and everywhere were taking off their head phones, were shutting off their loud speakers and leaning back with sighs of satisfaction.

For, through the eyes of J. Andrew White, Editor of The Wireless Age, they *saw* the fight, saw it almost as clearly as if they had been at the ringside with him. They heard by radio the gong, the shouts of the crowd and Mr. White's voice-picture of the bout as it progressed round after round.

A world's championship match had been broadcast before. The radio audience back in July, 1921, received the reports of the "Battle of the Century" between Dempsey and Carpentier, but in that instance, as in others, the description of the match was telephoned by wire and then relayed by another voice speaking by radio. No such roundabout process was used in broadcasting the Leonard-Britton bout. Through a radio engineering feat, described elsewhere in this article, the voice of one man was used, that of Mr. White, at the ringside.

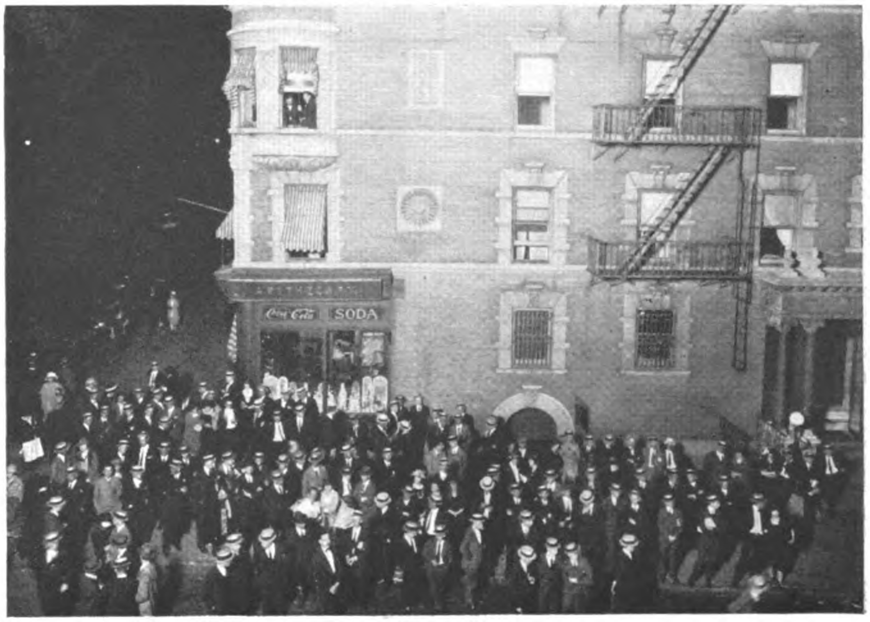
On the night of the championship match, Monday, June the 26th, the weather in the Metropolis was ideal, even for New York. The streets were crowded with a restless, ever-moving throng from the Battery to Van Cortlandt Park, from one end of Brooklyn to the other, and in the congested sections of the Bronx. It was a clear night, just a trifle too hot for the theatre and not hot enough for the seashore resorts, so the people stayed in town and Broadway claimed its own.

The subways, the busses and the taxi cabs were filled to capacity, Velodrome bound, but the huge bowl despite its proportions after all could only hold a bare 30,000 and greater New York claims more than 7,000,000.

A Rush for Home

So those who owned radio receiving apparatus stayed at home, having eagerly anticipated for a week the broadcasting of the championship match. They did not want to miss it. Those who did not own receiving equipment tried their best, if they were not going to the fight itself, to ferret out a friend who was fortunate enough to possess one.

The town was on edge and in the



Just one of the New York street-corner crowds that gathered in front of loud speakers. In this case, part of the radio and boxing fans at 94th Street and Broadway, where 450 people heard the description via an instrument in the laboratory of the Waveolian Radio Corporation

words of the showman, the stage was set for a successful event.

There are scattered along Broadway and throughout greater New York many small dealers in radio equipment. They too "sensed" the eagerness of the crowd and had—practically every one of them—loud speakers rigged up, and announced in advance that the description of the bout would be heard.

The crowds paused. They heard a voice:

"This is WJZ, the Radio Corporation-Westinghouse Broadcasting Station at Newark, New Jersey. A blow-by-blow description of the Leonard-Britton championship bout will now be given from the ringside at the New York Velodrome. One moment please, while we make connections."

The crowd became interested. It seemed to settle—to lose its roving spirit.

"Hello! Hello! Good evening. This is J. Andrew White, speaking from the ringside. A blow-by-blow description of the championship match will now be broadcast via WJZ. The contestants are not quite ready so I will first describe for you the scene here at the Velodrome."

The thousands listened while the voice told of the colorful crowd in the banked up seats and went on to say that Jack Dempsey was coming up the aisle; other celebrities of art and industry were mentioned; a famous sporting editor was introduced, and an effort made to have him say a few words over the radiophone. Another pause and then the same voice announced that the boxing expert was overcome by modesty and stage fright, but that he sent his greetings. Then the voice introduced Senator James Walker who fathered the present New York State boxing law, announcing that Senator Walker would say a few words. This he did and in his short speech declared that the members of the New York Boxing Commission were convinced that the public wanted clean sport and that its belief was being fully justified in the capacity crowd at the Velodrome and in the knowledge that 250,00 more people who could not get in, were listening to the radio description that night.

And then the voice of the observer went on to say that many women were present, and had enjoyed the preliminary bouts.

A gong clanged incessantly and the voice explained that the gong the radio audience had just heard was rung in the endeavor to secure silence from the crowd, because the announcer, Joe Humphreys, had something to say. This was to introduce the boxing champions present and then the principals of the bout and to give their weight and so forth. Then there was a pause and a deafening roar; the voice explained that this was the greeting accorded Leonard and Britton by the crowd as the two champions entered the ring.

"In a moment the fight will commence," said the voice.

By this time the crowds along Broadway had become completely absorbed and all thoughts of drifting further had fled from their minds. Knots of people, grouped around the many loud speakers in front of the radio shops, waited with bated breath.

Truly, radio was claiming its own.

Clang—gg-g!!

"That," said the voice, "was the gong for the commencement of the first round. The men are now in the center of the ring, sparring lightly for an opening. Leonard lands a light left on Britton's face. The men are sparring. Leonard jabs a left to the face. He jabs another left without any return from Britton. Britton tries a left hook to the body but fails to connect. Another left hook and another to the same spot fall short. Leonard connects with a left jab to the face. The men now are in a clinch. Britton lands a left to the stomach. Leonard crosses with a right to the face and Britton counters with a hard left to the stomach. The men again go into a clinch. Leonard tries a right but is high and Britton makes a left dig to the body. The men are sparring..."

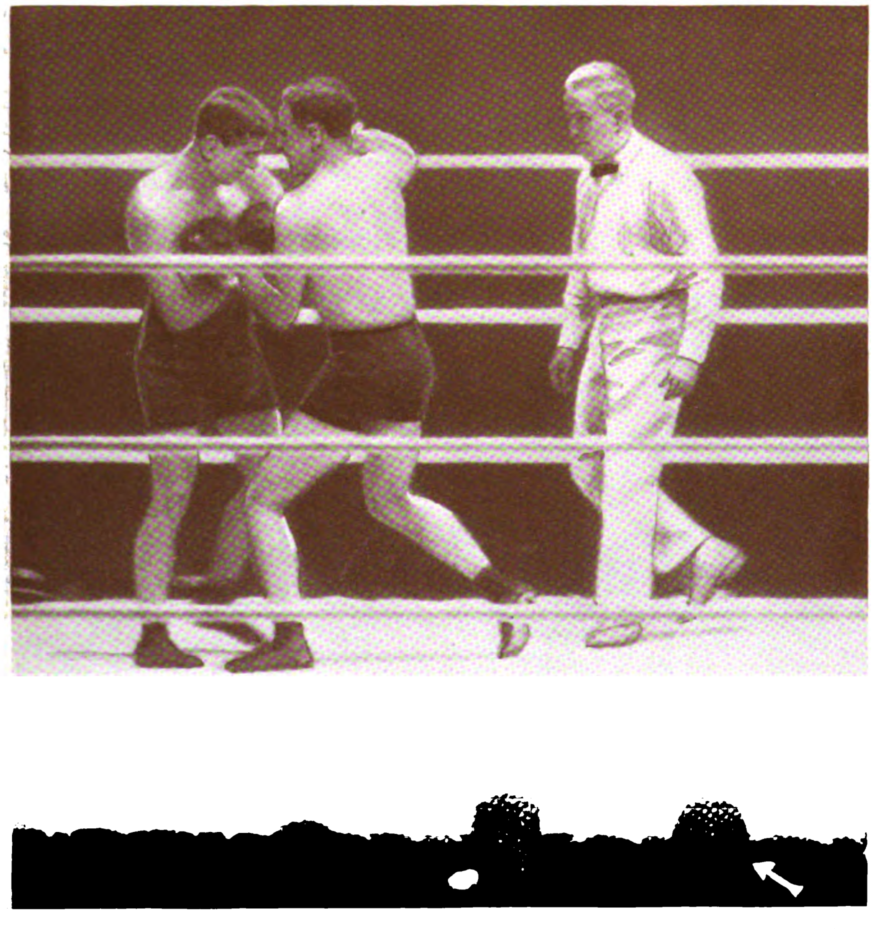
Clang—gg-g!!

"That is the bell for the conclusion of the first round. The men are now going to their corners and are receiving the attention of their seconds. Neither man shows any effects of the milling of the first round."

The writer wanted to get an unbiased description of how the news was received by those listening in. He did not stay in any one group; he did not pick out any one locality; nor did he disclose to any friend he happened to meet that he was there to record the impressions of the crowd, because he wanted to have clear-cut, frank and unbiased expressions from the thousands who were listening in.

And he can say in all sincerity that if one conclusion could be drawn from his wanderings around the Metropolis that night, that if one outstanding point must be emphasized, as to what he learned from his observation, then it was the fact that the public has accepted radio as something established, not to be marveled at, not astounding, but something as matter-of-fact as the telephone, typewriter, and almost as commonplace and convenient as the megaphone.

That in itself is really astonishing. Radio telephony, as the public knows



Arrow points to J. Andrew White, Editor of The Wireless Age, who was the ringside announcer for the radio public. Photo shows Britton (center) landing a blow in an early round, with Referee Patsy Haley keeping a watch on every move

it, has been a familiar agency only a little over a year, and yet within that short time the people have passed through the stage wherein it was a scientific phenomenon to be regarded with awe. They now class it with other established means of communication.

In but one or two instances during the entire period that the returns were coming through, the writer heard such exclamations as "Gee, that's wonderful!" "Just think—by wireless!" and "So plain, too!" For the rest, it appeared that the assembled crowds had their minds concentrated on the words that they heard and not on the medium through which they heard them. At some shops very little amplification was used and as a result the crowd could only be four or five deep around the horn. Those up close, in their eagerness and in the excitement of the moment, would pick up a phrase and relay it to those beyond the point where the words were clearly distinguished.

In most of the shops, however, the voice came over very strong and in such instances the streets were blocked from sidewalk to sidewalk with a listening mob. In many such instances people at the most distant point of the crowd could hear the results more clearly than could those directly under the horn.

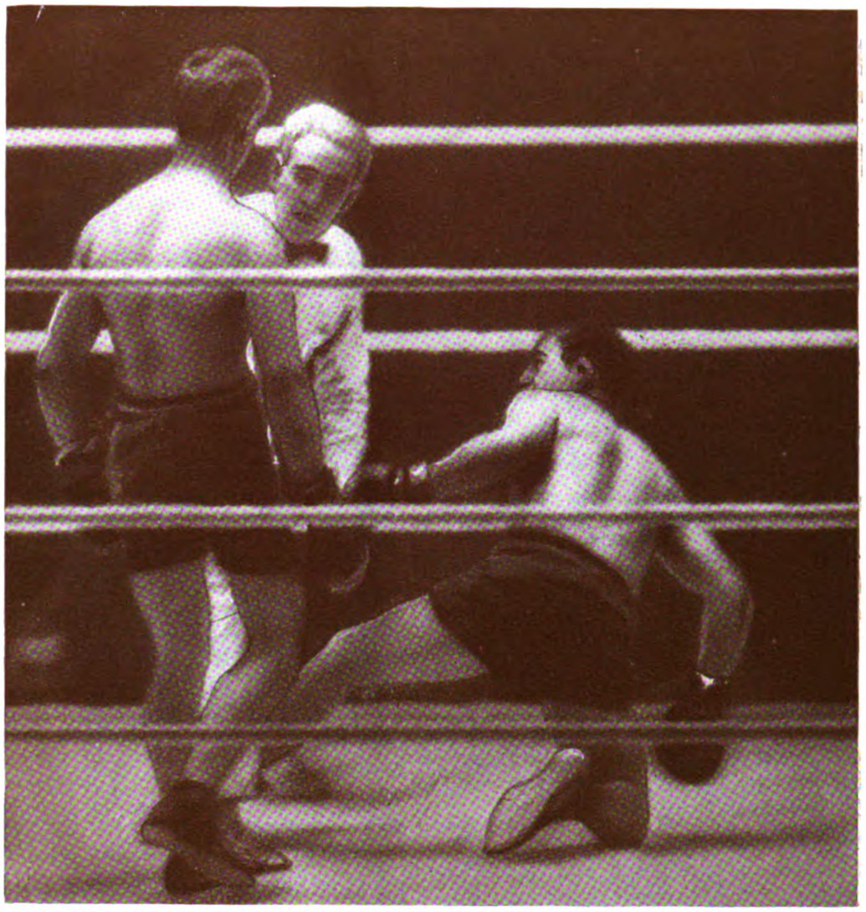
So great were the crowds around these high amplification loud speakers at several points that police reserves from the district precinct had to be called out to clear the traffic. At 94th Street and Broadway, two loud speakers were extended from second story windows, one on the Broadway side and another on the 94th Street side. On the Broadway side, traffic regulations restricted the size of the crowd but on the 94th Street side people were packed up against the sides of the buildings on the opposite street corner. The groups included men, women and children, who stayed from start to finish.

At Times Square, the heart of New York, the crowd became so great on the street that the manager at the radio shop was forced to lessen the volume of sound because with the power that he was using the voice travelled as far away as the Claridge Hotel, which is a good 250 yards away.

Gong Pleases Crowds

And then still farther on downtown, at 23rd Street, similar scenes were being enacted, with police lines holding the crowd in check. And so in Brooklyn. And the Bronx. And Staten Island. And Jersey City. And Newark. And everywhere.

The thing that tickled the fancy of the crowds that night, more so than possibly any other point, was the clearness with which the gong could be heard. It brought a smile to every face, an involuntary smile. It was one of the little touches that made the whole affair so real, and delighted all even more than hearing the crowd cheer and yell.



The foul in the exciting boxing exhibition in the thirteenth round. Leonard (left) being waved to his corner by Referee Patsy Haley. Leonard hit Britton after the latter had dropped to one knee, and the photographer caught the group a second later

It was the one time, if at any, when the crowds along Broadway lost their poise. They chuckled with that same sheepish snicker of the school boy caught smoking corn silk. A few seemed to realize for an instant that they were, after all, listening to history in the making and that fully as wonderful as the description of the bout itself, was the instrument used to describe it.

But only for an instant, and then in the next second the crowd settled back into that same sophisticated attitude it already had assumed—an attitude closely identified with New York.

"We know radio is practical. We know it is here to stay. We realize the voice comes over clearly. What we want to hear is the fight." That was the sentiment of the crowds in the nation's metropolis.

But not only the people of New York were being entertained that night. Radio knows no limitations within the scope of the power used or of the sensitiveness of the receiving apparatus, so that at the same instant New Yorkers were hearing Mr. White's words, so were people in many other states.

"I do not know when I have enjoyed anything more thoroughly than your ringside account of the fight," Chester M. Scripture of Willimantic, Connecticut, told officials of WJZ.

"Mr. White's voice came over very clearly and was understood by all of us. I could hear the bell and the shouting of the crowd."

In another part of the State, at Bridgeport, other fans were fully as enthusiastic and as a typical example of what was going on there may be cited the little party that was held in the home of E. J. Huber, manager of the Postal Telegraph-Cable Company of this city. The little group was so enthusiastic that it actually cheered when Britton was declared the winner, just as though they were at the ringside, and all Mr. Huber's friends agreed that was one of the most enjoyable evenings they had ever spent.

It seems rather peculiar to imagine anybody in staid Boston, Massachusetts, having a ringside seat at the bout. But that is exactly what M. J. Daley of that city told friends that he considered he was having.

Mr. White's voice also penetrated Pennsylvania and found its way into homes in Wilkes-Barre, Scranton, Nanticoke and other places. S. L. Fenstermacher of Berwick, Pa., held a little party that night and about a dozen persons listened in at his home. Another little drama was enacted in his house that night and the little group declared that they could see the blows that were being described and every now and then they would break out in excited exclamation. The comment of F. R. Krupp, of Scranton, Pa., was very much like that of others of his State.

"We could hear all the details, the gong for each round, during the time that we were listening in. We could hear the uproar from the crowd because of the foul, and we could hear the gong ring for silence just before the referee made his announcement."

It was a great night for clubs, and many of them called special meetings. That is what happened to the Hooker Hall Radio Club of Springfield, Mass., according to the record of Ernest A. Berry, secretary.

"Forty members of the club listened in," said Mr. Berry. "Static conditions interfered somewhat with us but we were able to follow the fight round by round. But here in Massachusetts many people did not know in advance that the fight would be broadcasted and when they finally learned of it there was a mad scramble for the phones."

Indiana, too, was represented and from Veedersburg of that State, Marvin H. Cook wrote to congratulate WJZ.

And even at Bridgeton, Maine, the returns were heard. A. P. Clark of that city told friends that with his vaccum tube set, without amplification, he heard every word of the announcer perfectly and he could catch the noise of the crowd and the ringing of the gong clearly. Thousands of letters since the fight have reached the desk of Mr. White and of officials at WJZ. They came from widely scattered points, although the bulk of them were concentrated within a radius of one hundred miles of Newark.

It will be of interest to the radio public to read some of these letters which are printed in this issue.

Special Technical Equipment Insured Success

The technical arrangements by means of which the voice of Mr. White was broadcast from WJZ necessitated the use of much special equipment at the ringside and at WJZ. Special facilities were supplied, too, by the American Telephone & Telegraph Company in providing continuous and undisturbed wire line transmission between the ringside and the Newark station.

A transmitter of special design was used at the ringside. It was connected to several steps of audio-frequency amplification, in order to strengthen the voice of the speaker so that it would be of sufficient volume to properly modulate the transmitting set at Newark.

A special telephone line was run to the ringside from the nearest telephone cable, and connection made at the local telephone exchange with a through leased wire which ran direct into the operating room of WJZ station. Here the voice of the speaker was further amplified before going into the modulation system of the regular transmitting set. Arrangements were made so that the operator in charge at WJZ could if necessary cut in on the wire and talk to Mr. White at the ringside, or, himself, talk into the transmitting set for the purpose of broadcasting the preliminary and final announcements concerning the undertaking.

At the Velodrome several technical men stood watch under direction of Walter Frazier of the Westinghouse Co., either at the transmitter itself, or along the line, prepared to act instantly in the case of the slightest interruption to the service. At the telephone exchange and at other control stations of the telephone company, experts stood by to insure constant and satisfactory communication. The operator in charge at WJZ listened to every word radiated from the station into space, and such adjustments as were necessary were made from time to time to insure proper quality and quantity of the voice coming from the ringside.

The reports of the technical staff record that there was not a single instant's interruption of the service, nor the slightest disturbing noise of any character on the line throughout the entire evening. That the public also appreciated the faultless service has been fully demonstrated by several thousand letters of appreciation received, which specially referred to the excellence of the technical arrangements.

A Ringside Seat in the Parlor.

(From an Orange, N. J., Radio Fan.)

The Leonard-Britton fight description entered many homes where heretofore this sport was never mentioned.

In addition to the returns as broadcast by WJZ, many listeners heard on the side something like the following:

Willie: "Hey Pop! the fight's gonna start."

Mother (answering for both): "You listen yourself; father and I are not at all interested."

Father (more interested than he appears to be): "Don't be foolish, let's see what it is like anyway."

Both join Willie at the receiving set, mother with a very disapproving look.

Mother: "Your bulbs are howling, Willie."

Father: "Howling nothing! That's the crowd yelling; just listen to that racket!"

Willie (trying to hear the announcer): "Yeh! can't listen cause of the racket in here!"

Two minutes of silent attention.

Willie: "Boy! this is gonna be the berries!"

Mother (disgusted with the thought of it): "Yes, I can just imagine what it is going to be like. I never—"

Father: "Never mind the lecture now; let's hear what is going to happen. There's the gong for the first round."

Reports follow of jabs, hooks and stiff blows, until mother can hold her peace no longer and remarks:

"Oh! that's brutal! their faces will be mashed to pulp!"

Willie: "That's nothing! just wait 'till they get going!"

Round after round the fight goes on with continued reports of heavy punching, suddenly followed by a loud roar by the crowd.

Father: "Listen! someone got knocked for a loop sure as guns!"

Willie: "Wow! sounds like church bells were ringing for somebody don't it?"

Mother: "Well! of all the language! Where in the name of heavens do you hear such talk?"

By the eleventh round, father has forgotten himself completely and is perched on the edge of his chair. Willie, all excited, sits grinning, while mother still talks of the cruelty of it all and is certain one of the fighters will be killed before it ends; nevertheless she still holds tight to the receivers.

Willie: "Gee!, listen to 'em holler!"

Mother: "Goodness! I don't see how that announcer can be so calm and unconcerned with all the racket. Willie, just open the window, it's getting terribly warm in here."

Willie (winking at Pop): "Whatsa matter ma, gettin' excited?"

Pop laughs, and for a reason all her own mother does not attempt to reply.

Father: "Well, can you beat that! Leonard loses by a foul," (*meekly*) "that's a shame."

Willie grumbles disgustedly because no knockout occurred, while father sharing his young hopeful's disappointment dare not say it.

Mother (still trying to appear disgusted): "Well that is certainly terrible! I don't see any sport in it at all!" (*unconsciously*) "My! it certainly must be very exciting to be there and see it!"

Willie: "Well! as long as you both enjoyed it so much (terrible as it was) I guess I'll write WJZ and tell him how good it was."

"How'd you like to go to a fight with me sometime Ma? Huh?"—Reinie.

Having refused an invitation to see the fight between Leonard and Britton, I remained at home while my husband joined a party of men who went to see the fight. Bouts have never interested me.

Seeking amusement, I went to the radio—expecting to hear the concert, instead I listened (intently too) to every detail of the fight. I clearly heard the gong, the crowds yelling and became so enthused I called in my neighbors—all I could find who were interested—and we were all thrilled!

Won't Mr. Owitz (my husband) be surprised when at breakfast I can discuss the fight—for instance I plan to say: "Wasn't it a pity Leonard got so excited he hit Britton while he was down. The first seven rounds was just mere play—but—the round Leonard nearly cinched the fight when the crowds yelled 'follow him up! Finish it!'"

(*Continued on page 42*)

The Future of Radio

Wireless Telegraphy Is 22 Years Old and Has a Permanent Place in Commercial Communications—Wireless Telephony Has Been Developing for 15 Years—Broadcasting's Vast Benefits Still Only Nebulously Perceived

By E. J. Nally
President Radio Corporation of America

CONTRARY to the popular understanding, radio has not come to us suddenly. It has been under development continuously during the past twenty-two years. Commercial radio communication, that is, overseas radio telegraphy, has reached a high state of development and has found its place in the commercial world. Radio is now carrying a large part of the telegraph traffic between the United States and Europe and between the United States and Japan, the total volume of traffic constantly increasing.

Radio telephony has been under development during the past fifteen years, and during the late war was successfully used for both one-way and two-way communication.

"One-Way" Broadcasting

Popular radio—relatively short-distance radio telephone broadcasting, is the outcome of the realization of the vast possibilities of one-way transmission of news matter, vocal and instrumental music, lectures, sermons, etc.

Radiophone transmission from central, organized sources of information and entertainment makes it possible for the citizen to receive this service through the small investment involved in purchasing a radiophone receiver.

E. J. Nally

It is not communication in a two-way sense; radio broadcasting is the employment of a fairly well developed science to a new use. Broadcasting is the recent development—not radio.

The future of radio telegraphy, therefore, is assured. It already has a healthy and well defined field. The future of radiophone broadcasting is another matter, and in this we can speculate with only the imagination limiting.

We may visualize the future of radio as developing in quantity and quality perhaps as news distribution has grown since Franklin's time, and as organized entertainment has grown in popular favor since the days of the Globe Theatre.

Radiophone broadcasting here gives us a new facility by means of which these potent agencies of civilization may be strengthened and made more popular and universal.

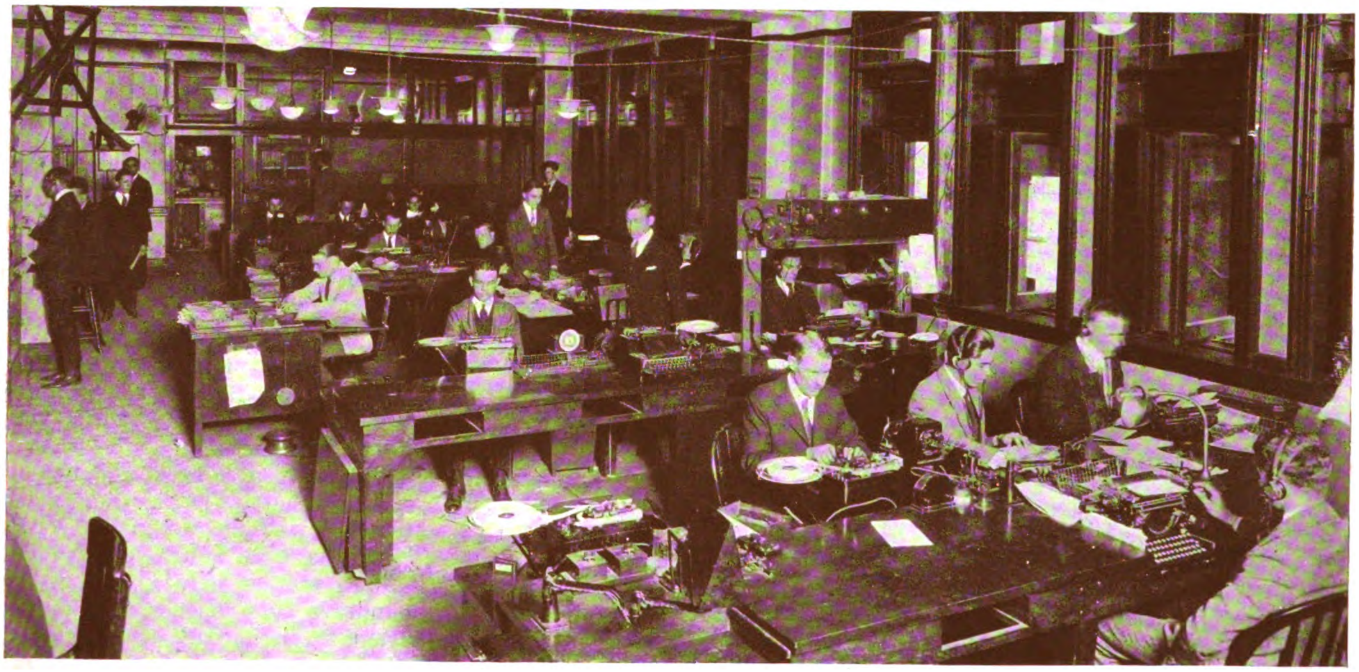
Broadcasting already has given the condition of isolation a new meaning. Isolation now, if it exists, must be a desired condition. No man, no family no matter where located geographically with regard to railroads or wire telegraphs, need be beyond the range of daily radiophone broadcasting of news items and entertainment.

Infinite Possibilities

It is difficult to understand how any thinking person can believe that broadcasting will not be further extended. Isolation of families in rural or mountain districts no longer need be involuntary.

The facility of the radiophone is here. It is available. If there is anything nebulous about its status, it is only that its vast, significant possibilities have been realized so recently that there is not yet agreement as to what its most useful application shall be.

In the meantime it is serving—making its way here and there and getting acquainted, so that we may well believe that in time it will occupy a destined place among the great forward steps of civilization along with the newspaper, the magazine, the rural phone and the automobile.



Operating room, showing high speed recorders, of the Radio Corporation of America, at New York City. Here the transmission of the Rocky Point plant is controlled

University Gets Phone Transmitter

THE University of Rochester, Rochester, N. Y., has just been presented with a radio telephone transmitting set by the Democrat and Chronicle and the Times-Union. The set had been built for the first-named newspaper, which at first planned to operate it, but after considering the superior advantages of it for the university, suggested to the second paper that they join in making the gift. The Eastman School of Music of the university will operate the set, broadcasting the programs given in the school's new Eastman Theatre. Excellent entertainment over a wide range should be provided, as the Eastman school is considered one of the best musical institutions in the country.

Song-Leading By Radio

"WHAT next over the radio!" marvels the man who has had lectures, concerts, vaudeville acts, and even musical comedy wafted to him on radio waves.

And from Seattle, Washington, comes the answer. "Community singing, of course!"

During a reception given there this year to Marshal Joffre, Mr. R. H. Vivian, the director of music for Seattle Community Service, sang through the radio telephone, for groups gathered around loud speakers in all parts of the city, each group joining in the songs under the direction of a leader. And not only did Mr. Vivian lead the singing for the people assembled under the song leaders, but he made it possible for those in every home or institution which was equipped with a radio apparatus, to join in the great chorus that was sweeping the city in honor of the French hero. Orphanages, hospitals, and shut-ins had the opportunity of participating in Seattle's welcome to Joffre.

Community Service organizations in other places have made use of the radio, but none in such an unique manner as Seattle. During San Francisco's Music Week a Community Service day was arranged at the radio studio of the "San Francisco Examiner" and a program of heart songs, dedicated to those confined in the hospitals of the city, was broadcast.

Radio Aids Home Makers

JUST as newspapers contain departments for women, so have the radio telephone broadcast programs been giving time to subjects of home interest, such as dressmaking, cleaning, cooking and all the thousand and one problems facing the housewives of America. Competent speakers on domestic subjects appear from time to time on the programs.

Principal Broadcasting Stations

KYW—360 Meters. Daily, 8 P.M. Central time, 9 P.M. eastern time. Westinghouse Station located at Chicago, Ill.

KDKA—360 meters. Daily, 8 to 10 P.M. Westinghouse Station located at East Pittsburgh.

WBZ—360 meters. Sundays, Mondays, Wednesdays and Fridays, 8 P.M. Westinghouse Station located at Springfield, Mass.

WGI—360 meters. Evenings, American Radio and Research Corporation station located at Medford Hillside, Mass.

WGY—360 meters. Tuesdays, Thursdays and Fridays, 7 P.M. General Electric Co. Station located at Schenectady, N. Y.

WJZ—360 meters. Daily, 11 A. M. to 10 P. M. Radio Corporation-Westinghouse Station located at Newark, N. J.

WVP—1450 meters. Evenings, 9 to 9:55 o'clock, except Sundays and Holidays. Signal Corps, Bedloe's Island. New York Harbor.

WWJ—360 meters, Daily, The Detroit News, Detroit, Mich.

KYJ—Lee J. Meyberg Co., Los Angeles, Cal.

KDN—Lee J. Meyberg Co., San Francisco, Cal.

WGR—Federal Telephone & Telegraph Co., Buffalo, N. Y.

WOK—Arkansas Light & Power Co., Pine Bluff, Ark.

WLW—Crosley Mfg. Co., Cincinnati, Ohio.

WOC—Palmer School of Chiropractic, Davenport, Ia.

WLB—University of Minnesota, Minneapolis, Minn.

Stations Broadcasting Music and Speech on 360 Meters

Additional List to Those Previously Published

WSB	The Atlanta Journal	Atlanta, Ga.
WFAA	Dallas Morning News	Dallas, Texas
WEAX	T. J. M. Daly	Little Rock, Ark.
WEAY	Will Horwitz, Jr.	Houston, Texas
WEAZ	Donald Redmond	Waterloo, Iowa
WEAN	Shepard Company	Providence, R. I.
WFAB	Carl Frank Woese	Syracuse N. Y.
WEAR	Baltimore American & News Pub. Co.	Balto., Md.
WEAU	Davidson Bros. Co	Sioux City, Iowa
WEAT	John J. Fogarty	Tampa, Fla.
WEAS	Hecht Company	Washington, D. C.
WEAP	Mobile Radio Co., Inc	Mobile, Ala.
WEAO	Ohio State University	Columbus, Ohio
WEAV	Sheridan Electric Service Co.	Rushville, Nebr.
WEAQ	Y. M. C. A	Berlin, N. H.
WCAZ	Robt. E. Compton & Co., Quincy Whig Journal,	Quincy, Ill.
KDZV	Cope & Cornwell Co	Salt Lake City, Utah
WCAV	J. C. Dice Electric Co	Little Rock, Ark.
WDAD	William Louis Harrison	Lindsborn, Kansas
KDYU	Herald Publishing Co	Klamath Falls, Ore.
WDAI	Hughes Electrical Corp	Syracuse, N. Y.
WDAC	Illinois Watch Co	Springfield, Ill.
WDAF	Kansas City Star	Kansas City, Mo.
WCAY	Kesselmen O'Driscoll Co	Milwaukee, Wisc.
WDAG	J. Laurence Martin	Amarillo, Texas
WDAK	Mine & Smelter Supply Co	El Paso, Texas
WCAW	Quincy Herald and Quincy Elec. & Supply Co.,	Quincy, Ill.
KDYW	Smith-Hughes & Co	Phoenix, Ariz.
WDAB	M. C. Sumner & Son	Portsmouth, O.
WKB	Sweeney School Co	Kansas City, Mo.
WDAE	Tampa Daily Times	Tampa, Fla.
KDYS	The Tribune, Inc	Great Falls, Mont.
WCAX	University of Vermont	Burlington, Vt.
WDAA	Ward-Belmont School	Nashville, Tenn.
KDYY	Rocky Mt. Radio Corp	Denver, Colo.
WDAJ	Atlanta & West Point R. R. Co.,	College Park, Ga.
KDZF	Automobile Club of So. Calif.,	Los Angeles Calif.
WEAC	Baines Electric Service Co	Terre Haute, Ind.
KDZG	Cyrus Peirce & Co	San Francisco, Calif.
WEAA	Fallain & Lathrop	Flint, Mich.
KDZH	Fresno Evening Herald	Fresno, Calif.
WEAD	Northwest Kansas Radio Supply Co.,	Atwood, Kan.
WEAB	Standard Radio Equipment Co.	Fort Dodge, Iowa
WEAK	Julius B. Abercrombie	St. Joseph, Mo.
KDZR	Bellingham Publishing Co	Bellingham, Wash.
WEAI	Cornell University	Ithaca, N. Y.
KDZI	Electric Supply Co	Wenatchee, Wash.
KDZJ	Excelsior Radio Co	Eugene, Oregon
KDZM	E. A. Hollingworth	Centralia, Wash.
KDZQ	William D. Pyle	Denver, Colo.
KDZK	Nevada Machinery & Electric Co	Reno, Nevada
KDZP	Newberry Electric Corp	Los Angeles Calif.
WEAG	Nicholas-Hineline-Bassett	Edgewood, R. I.
WEAM	Borough of North Plainfield	North Plainfield, N. J.
KDZL	Rocky Mountain Radio Corp	Ogden, Utah
KDYX	Star Bulletin Publishing Co	Honolulu T. H.
WEAH	Wichita Board of Trade & Landers Radio Co.,	Wichita, Kan.
KDZA	Arizona Daily Star	Tucson, Ariz.
WDAD	Automotive Electric Co.	Dallas, Tex.
WDAL	Florida Times Union Co	Jacksonville, Fla.
WDAN	Glenwood Radio Corp	Shreveport, La.
WDAQ	Hartman-Riker Elec. and Mach. Co.,	Brownsville, Pa.
WDAR	Lit Bros	Philadelphia, Pa.
WDAP	Midwest Radio Central, Inc	Chicago, Ill.
KDZB	Frank E. Siefert	Bakersfield, Calif.
WDAM	Western Electric Co	New York, N. Y.
WDAT	Delta Electric Co	Worcester, Mass.
WDAW	Georgia Railway & Power Co	Atlanta, Ga.
WDAK	Hartford Courant	Hartford, Conn.
WDAU	Slocum & Kilburn	New Bedford, Mass.
WDAS	Samuel A. Waite	Worcester, Mass.
WDAX	First National Bank	Centerville, Iowa
WDAY	Kenneth M. Hance	Fargo, N. D.
KDZD	W. R. Mitchell	Los Angeles, Calif.
WDAV	Muskogee Daily Phoenix	Muskogee, Okla.
KDZE	The Rhodes Co	Seattle, Wash.
WDZ	James L. Bush	Tulscola, Ill.
KDZW	Claude W. Gerdes	San Francisco, Calif.
KDZX	Glad Tidings Tabernacle	San Francisco, Calif.
WFAC	Superior Radio Co	Superior, Mich.
WFAD	Watson, Weldon Motor Supply Co	Salina, Kan.
WFAF	Henry C. Spratley	Poughkeepsie, N. Y.

Radio's Relation to Advertising

ADVERTISEMENTS of the Lackawanna Railroad are featuring the fact that radio telephone broadcasting concerts may be heard aboard the Buffalo Limited and the New York Limited, both of which are equipped with receiving sets.

In the old style railroad "ad," the beauties of the scenery through which the train passed were featured, but now, railroad officials of those lines which have installed radio apparatus apparently believe that the lure of hearing radio music is stronger than that of scenery.

Radio and Racing

DETAILED information regarding the "Kentucky Special," the most important horse race of the season, was broadcast by the Crosley Manufacturing Company, Cincinnati, Ohio, operators of the radio station WLW, during the recent race at Latonia.

The voice of Jack Dempsey (not the boxer of the same name) official caller, was carried from the judges' stand at the Latonia track to the broadcasting station by the wire phone, and there transmitted by the wireless telephone station.

The system worked successfully, hundreds of persons calling up after the race and asking that radio telephone announcement of races be made a permanent feature.

Radio Rings Alarm Clock

ACCORDING to Radioelectricite, the French radio paper, a Frenchman has succeeded in constructing a radio alarm clock. He uses a receiving apparatus tuned to respond only to a call consisting of certain letters sent at a certain speed. When the proper combination of dots and dashes is received, the last signal operates a relay that closes a circuit and rings a bell. If the Eiffel Tower could be persuaded to send its time signals early in the morning the device could be used instead of the ubiquitous American alarm clock to awaken the nation.

Radio Invades "The Village"

GREENWICH VILLAGE, New York's much-advertised artist quarter, where even today candles are esteemed above electric light even by those who can afford the best, has become enthusiastic over the radio telephone. This is a great tribute, as it is about the only modern development that many of the Greenwich Villagers ever have been enthusiastic over, outside of matters of art. 'Tis said that hundreds of Villagers now prefer to listen to the broadcast programs instead of to the "parlor Bolsheviks" who abound there.

Nellie Kouns

A Chat About Radio With

Nellie and Sara Kouns

By Edwin Hall

Sara Kouns

THE first chapter of this little story takes place aboard a huge ocean liner returning to New York from Europe shortly after the outbreak of the great war in 1914.

The famous Kouns sisters, Nellie and Sara, were homeward bound from Europe with members of their family. On the same vessel was the great Marconi, and it so happened that the Marconi party became acquainted with the Kouns group and Marconi himself took the sisters to the wireless cabin of the ship and explained to them the mysteries of the great new science which soon was destined to conquer the world. "The time will come," Marconi told the sisters, "when you will sing into a little instrument and your voice will be carried through the air for hundreds of miles and will be heard by people everywhere."

* * *

How true this prophesy was, everyone knows. The Kouns sisters, themselves, told of Marconi's prediction when the interviewer called to get their impressions of the radio-telephone for the fans who heard them sing from WJZ.

"We had been so impressed by the words of Marconi," said Nellie Kouns, "that when interest in radio suddenly awakened as it did, we were not as astonished as we might have been."

SING FOR MUSIC RECORDS

"But the thing," added Sara Kouns, "that did impress us was the fact that we should be among the very first, if not the first, to be asked to broadcast from the station at Newark."

The Kouns sisters are exclusive phonograph artists for a well known manufacturing company and they have confined themselves during the past few years largely to the making of records. They also have appeared on the concert stage and at one time were in vaudeville.

They decided to have some fun with their interviewer when he pleaded with them to put on a record of their own making.

"See if you can guess who is singing and when one stops and the other takes up the song," they urged him. He did his best to guess while the record played, but only revealed his confusion, for except when they were singing together it was impossible to distinguish between the voices of the two sisters.

So alike are the voices of Nellie and Sara Kouns that they are called the "mirror voiced sopranos," each a perfect reflection of the other.

The sisters, remembering the prophesy made to them by Marconi nearly ten years ago, are confident that when the development of the radio-telephone has progressed to a more advanced stage, it will be possible and feasible to transmit the voice half way around the world.

"We feel the time will come," said Nellie, "when people in all parts of America will hear the voice of a Chinese or Japanese girl singing in the far-off Orient."

"Yes," supplemented Sara, "and Italian music too, straight from Italy—and French and German." And then they pictured a rosy scene wherein all the world was a single unit with one common aspiration—the universal desire for art!

And the radio telephone, they say, will be the medium through which this long-sought goal will be attained.

Nellie and Sara Kouns were born in Topeka, Kansas. They are daughters of the late Charles W. Kouns, former general manager of the Santa Fe Railroad. They received their initial music instruction under the watchful eyes of American teachers; then they went to Germany to complete their studies.

Their only object in studying music was to secure the personal pleasure and satisfaction that a knowledge of it brings; the idea of going on the professional stage was far removed from their thoughts and from the thoughts of their father. When they were offered engagements at the Royal Opera in Munich he withheld his consent, and to make certain that they would not yield to the temptation of this splendid offer he made a special trip to Europe and brought them home during the early days of the war. It was on this trip back that the prophesy was made to them by Marconi as related in the early lines of this story.

DEBUT IN CHICAGO

Yielding to the entreaties of friends and the pleading of the sisters themselves, Mr. Kouns finally gave his consent for them to appear in concert and their debut took place in Chicago.

Then followed a tour across the continent that created a wave of enthusiasm for the sisters. It was at the height of their success that they gave up all their plans in the emergency created by the war, and under the auspices of the Y. M. C. A., went to France to entertain the doughboys.

At the Paris opera, in Nice, Cannes, Monte Carlo and in the Army of Occupation on the Rhine, their voices were heard and they became favorites with the A. E. F. A professional season in England and France followed in 1920 and left in its wake a trail of ever-increasing popularity. In the spring of 1921 they returned to New York. Toward the end of the same year they received a call to come to WJZ and entertain the radio audience, a call which they graciously accepted, to the delight of all who heard them.

Canadians Growing Enthusiastic

CANADA is fully as enthusiastic about radio telephone broadcasting as is the United States. The Winnipeg station has already been heard in various parts of the states, as well as in a large portion of the Dominion.

Radio in Canadian Theatres

THAT radio will play an important part in entertaining the Canadian public in the near future is shown by the fact that the Independent and United Amusements Limited, Toronto, who own and operate the Strand, Regent, Papineau, Belmont, Plaza and Moulin Rouge Theatres have installed receiving sets in all their houses and will give a radio concert every evening.

They have secured the services of a number of artists who will entertain the different audiences at these theatres, the artists performing in the Marconi Company's large new broadcasting station on the roof of the Canada Cement Building.

At the conclusion of the local concert the operators in the different theatres will endeavor to pick up more distant points where concerts are in progress, such as New York, Pittsburgh, Springfield and other distant points where large broadcasting stations are situated.

Mexico Likes Broadcasting

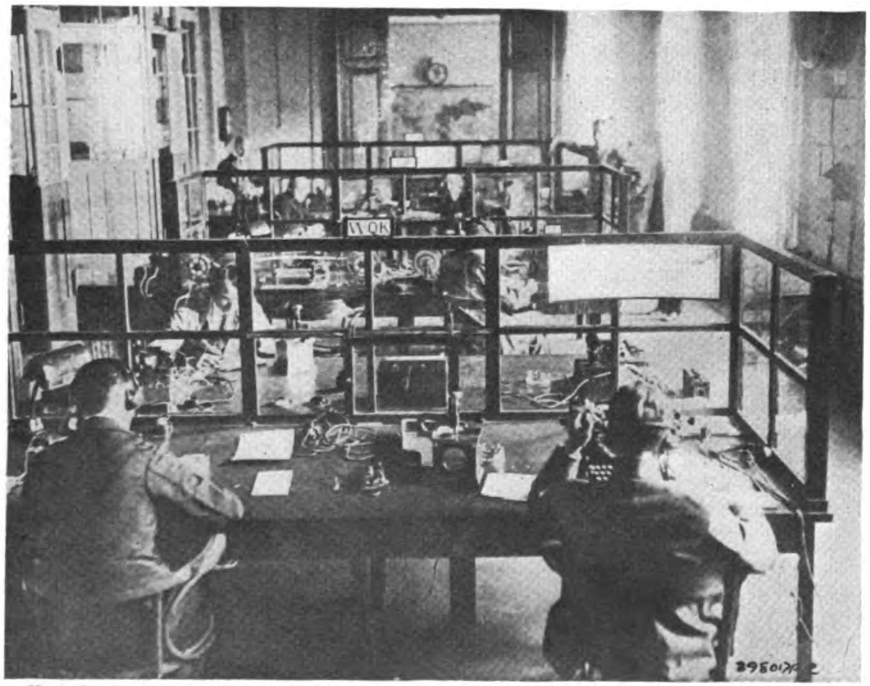
EFFORTS are being made in Mexico to make it easier to secure permission to operate radio telephone broadcasting stations there. At present much red tape has to be wound and unwound in getting permission from the Mexican Government, and so far only about twelve stations have been authorized. Many applications are pending. President Obregon has been asked to establish a special radio bureau to handle the work of licensing and regulation. The stations now in operation in Mexico have done much good work, and sales of radio telephone apparatus are increasing fast. The radio telephone is proving valuable especially in the remote mining districts.

Toronto Paper Opens Station

THE *Daily Star* of Toronto, which has been using the radio telephone transmitter of the Canadian Telephone Co. for broadcasting purposes, now has its own station, CFCA, and is broadcasting nightly programs at 7 p. m. on 400 meters. The station has been heard at a distance of from 500 to 700 miles, using six amperes in the antenna. The set uses four 500-watt oscillator tubes, and a 250-watt tube as a modulator. The antenna is of the T-type, 200 feet long, supported on 80-foot steel towers on the roof of the *Star* building.

Miners Carry Radio Sets

PROSPECTORS and mining men in Northern Ontario are alive to the possibilities of the radiophone, and many camps will this year be brought into touch with the "outside world." Some of those who are hunting for mines are including radio equipment in their outfits, and the far-off haunts of these men of the trail where the feet of women have never trod will ring this year with the finest voices of Broadway. Great stretches of trackless forest will no longer separate these pioneers from the news of the world, thanks to the radio telephone.



Here is the operators' room in the new trans-Atlantic radio station near Berlin, where the traffic to and from the United States is handled. The station has been opened only recently

London Has $10 Sets

SO FAR the cheapest receiving set yet developed in England for use by novices is priced at two pounds, or not quite $10. Due to Government restrictions, broadcasting has been hampered and is just commencing in a limited way, with the result that a considerable demand is being built up for receiving apparatus. The average British amateur, however, buys a few parts and builds his own set rather than buy complete installations.

Radio Fingerprints Will Aid International Police

POLICE Commissioner Richard E. Enright of New York City, who recently returned from Europe, has been much interested in experiments in transmitting fingerprints by radio. He observed the results of a system developed in Copenhagen, and expects that it will do much to make radio, both telephone and telegraph, the aid to the police that it is bound to be. Commissioner Enright's trip abroad was taken for the purpose of arranging closer co-operation with European authorities, as many crimes have an international aspect. With the new radio fingerprint transmission facilities, it will be possible to secure such co-operation with the minimum of delay, as positive identification will be made possible within an hour or two of the arrest of a suspect.

Poland Interested in Radio

THE Polish minister of communications is coming to the United States to study our wireless system. His investigations will form the basis for the operation of the great station being erected at Warsaw, and also for future Polish radio telephone broadcasting activity.

'Tis Correct English

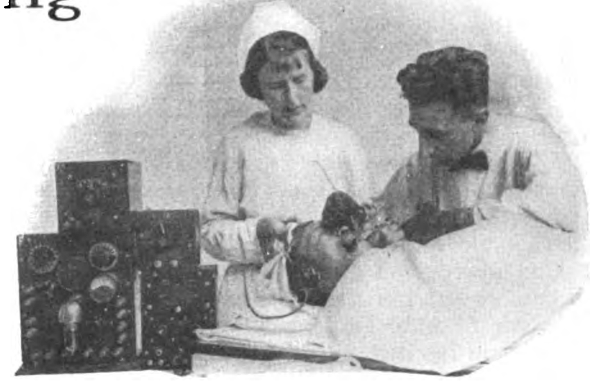
A LONDON literary weekly says "broadcasting" is a new word added to the language by wireless telephony. Such a periodical should rather have referred with pleasure to the fact that the good English verb "to broadcast" has found apt employment for many years.

There is a popular hymn which thousands of Lancashire people sing at Whitsuntide, whose first verse begins, "Sow in the morn thy seed," and ends with "Broadcast it o'er the land." Reference to the Thesaurus confirms the fact that "broadcast" was already in the language, and suggests that in its place we might easily have been afflicted with one of its synonyms. "Widespreading" would have been as good, but neither "divaricating," "diffusing," "dispersing," nor "disseminating" would have hit the mark so truly.

Radio Relief for the Ailing

Hospitals and Physicians Generally Consider Music Important in the Convalescent Period—Its Use Even During Operations—Wireless Telephone Concerts for Improvement of Mental Tone of Patients

By Ward Seeley



Radio telephone music absorbs the attention of the patient during an operation under local anaesthesia

HAVE you ever been ill in a hospital?

Not ill enough to be oblivious of your surroundings, as no one ever is for more than a comparatively few hours at a time, but just ill enough to be kept in your bed.

Do you remember how bored and disgruntled you were, how slowly the hours passed, how you slept as much as you could, just to pass the time away, how you wished you could do nothing but sleep and forget your troubles until it was time to get up and go home?

Perhaps you have been ill at home and had the same experience there.

It was a red-letter day when you were declared well enough to get up, walk about a bit, and see something of the world outside of the four walls that had hemmed you in, prisoned you in body and mind.

If you have gone through a long siege of sickness, as nearly everyone has, you will understand what the radio telephone now means to those who are confined to their beds day after day. It brings the news and music of the world to them. It gives entertainment, diversion, occupation. It actually hastens recovery.

Doctors for years have known that music is beneficial in many maladies. The mind has a powerful influence on the body, and often the patient's own mental condition is the chief obstacle to an early recovery. The body is willing, but the mind, from too long dwelling on misery, is unable to comprehend the fact that health is at hand. The mind after thinking of disease for weeks does not turn of its own accord to thoughts of health.

Radio changes all this. It gives patients the needed healthy stimulus from outside, bringing the happy, cheerful busy world to the ears of the sick, giving them other things to think about than their own condition. In many homes today the radio telephone is a great aid to sufferers, shortening their hours of tedium, lessening the period of their convalescence.

Radio Can Cheer and Heal

"Music can ease the strain of life for a great number of patients, but not for all. It calls up cheerful thoughts and lessens monotony, and it is of enormous benefit to the nervously broken down, to children, and to most surgical cases, for music appeals more to the emotions than to reason.

"People differ, not in opinion, but in stages of intellectual and spiritual development. So some want jazz and some want fugues, and neither is soothed by the music that pleases the other. Music might heal or injure. Wherever it cheers, though, it heals."

—DR. ALEXANDER LAMBERT,
Bellevue Hospital, New York City

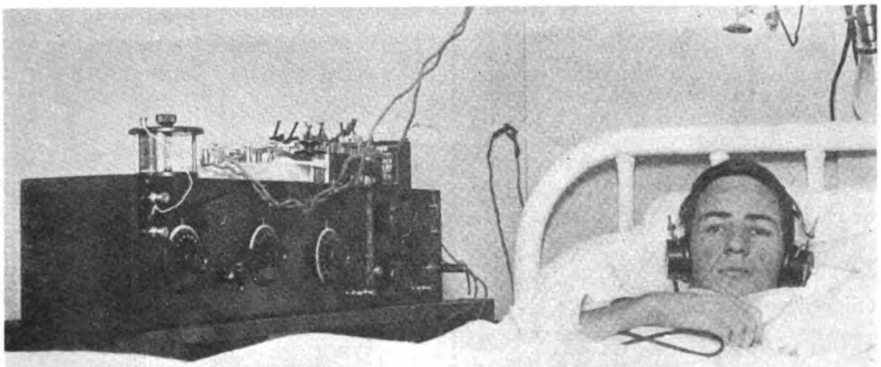
Hence it is that progressive doctors in all parts of the country, and particularly those in charge of hospitals, are eagerly taking advantage of radio.

Dr. W. F. Jacobs, Medical Superintendent of the Cumberland Hospital, Brooklyn, N. Y., said to the writer: "Radio deserves to be ranked with the best mental therapeutic agencies. In fact, for hundreds of cases the radio telephone can be prescribed as the one best treatment."

The Cumberland Hospital is a city institution, most of its patients being charity cases. Since last September Dr. Jacobs has been experimenting with radio for them, having installed several sets at his own expense in the original old hospital, now being evacuated as the new structure nearby is completed. The new building is being completely equipped with loud speakers and connections for headsets in all its wards.

"Think what it will mean," continued Dr. Jacobs, "for some poor devil, friendless, homeless, laid up with a broken back, never receiving any visitors, with nothing to do from one day to another but look at the wall and think. I have put headsets over the ears of many such men, and have seen them transformed in a few minutes from creatures that were just dully existing to the intelligent, interested men they once were and now soon will be again, permanently, and much quicker because of the interest, the life, the health that radiates from radio."

Dr. Jacobs has been a radio fan for about a year, and has gone through all the stages from a crystal set to his present one with radio and audio frequency amplification. He had an interesting experience last Winter, in the days when good headsets were hard to secure. He scoured the city for a headset of a particular make, and finally located one in a large de-



Lester Picker, San Diego, Cal., is helpless in bed with a broken back, but he is a licensed amateur whose call, 6AJH, is well known on the Pacific Coast. The radio telegraph and telephone keeps him cheery during his long helpless days and nights partment store. The clerk refused to sell it, saying that it was the only one in the store, was "stock" and was not for sale.

"But I've just got to have that headset," said the Doctor. "Who is head of the department?"

The clerk reluctantly named the manager of the radio department, and added the information that he was "hard boiled."

Undaunted, and full of the enthusiasm and determination that are characteristic of him, Dr. Jacobs bearded the lion in his den.

"You have a headset," he declared, "that means life and death to some of my patients. I don't ask you to give it to me, though it is a matter of big-hearted charity, to relieve the suffering of some poor mortals who think that the world has forsaken them. I can prove to them that it hasn't—with that headset. I can show them that it is worth while to get well—with that headset. Whether or not they recover is up to them now, for medicine has done all it can. They will have to do the rest. Radio coming through that headset will induce them to think of the joy of living instead of the pains of sickness; of life instead of death; it will banish their despair and bring them hope, faith and the determination to get well. Radio has done all that for many of my patients, and I want to give it to all who need it. And I have many who need it badly. Will you sell me that headset?"

The manager looked at the doctor. "The headset is yours," he said.

Doctors in charge of other hospitals also realize the great benefits of radio, and, further, its peculiar selective quality, in that by the use of head phones it can be made available only to those who are able. This makes it highly suitable for use in wards, so that patients who can benefit from the daily concerts can listen to them without disturbing others who may be so ill that the music would be of no value.

Easily Adaptable

This feature is to be used in the new Cumberland Hospital, where a loud speaker is to be put in every ward, and beside it a control switch and a jack. In wards where every case can benefit, the loud speaker will be used, while in others in which there are cases of various degrees of seriousness, the ear phones will be used. This system has been in use in the old building for several months, with sometimes startlingly beneficial results. At the time Dr. Jacobs was interviewed the radio apparatus was dismantled for moving into the new building, where a large room has been provided as a control station for the entire radio receiving equipment.

Funds for this installation are being collected privately by Dr. Jacobs, as New York City as yet has not appropriated money for the purpose. The Department of Public Welfare, is enthusiastic, from Commissioner Bird Coler down to the newest interne, and it is probable that in time city funds will be provided, but not after a delay of possibly several years. In the meantime, patients in the city hospitals and in fact in most of the others as well, must rely upon private charity for the radio equipment they need so much.

New York City Visiting Committee
105 East 22d Street

To the Editor:

There has recently been organized under the New York City Visiting Committee a committee on music which plans to arrange for regular concerts in the municipal hospitals and almshouses throughout the year. This committee, under Mrs. Russell Hoadley and Mrs. Francis Rogers, has been greatly interested in the possibilities of radio.

While they have decided not to install any mechanism this summer, it is their firm conviction that in the near future every institution will be equipped with radio apparatus. Endless vistas are opened for the bed-ridden and shut-ins generally.

No matter how excellent the medical care, nor how scrupulous the attention to material needs, the average patient in a municipal institution, where visitors are allowed only about twice a week, is apt to be discontented. He feels bored, out of touch with the world, impatient of delay. Imagine the change which a radio receiving station would make in this atmosphere! Without any tiring effort he can feel himself again a part of the world; his thoughts will be turned to something other than his own troubles and he will want more than ever to get well. There is reason to think that the period of convalescence would actually be shortened by the presence of the right sort of radio apparatus.

It is hoped that some generous friend will be inclined to give the necessary funds for installing radio in Bellevue and the other municipal institutions.

Very sincerely yours,

(Signed) Marion R. Taber,
Secretary.

WILL YOU HELP?

Work of Charity

Several of the hospitals in New York City already have interested philanthropists in radio, and are installing instruments. The Bronx Hospital is one of them. Maurice Dubin, superintendent, said: "The hospital is negotiating for the installation of a radiophone on the Roof Garden, for concerts to be given to the convalescent patients. We are also planning to have a receiving station in the wards for those who are bed-ridden. In connection with this work we intend to utilize the telephone receivers in order not to disturb patients who may desire to rest.

"I personally feel that radio can be of great service in hastening convalescence."

The Manhattan Eye, Ear and Throat Hospital probably is the best situated of all the New York hospitals, in its radio possibilities, as it already has an annunciator system with loud speakers in all wards and corridors, for calling the doctors. Reuben O'Brien, superintendent, now has a regenerative set with two stages of audio frequency amplification, and the sum of $100 has been provided for the purchase of a loud speaker. This is to be placed in front of the main transmitter of the annunciator system, which thus will spread radio concerts, news and sermons throughout the building. Inasmuch as the patients are well classified in the wards according to the seriousness of their cases, it is entirely possible to provide radio entertainment only to those whom it will benefit. Comparatively little interruption is expected due to the necessity of using the annunciators for calling purposes.

A Complete Installation

Another hospital that will use radio to the full is the Beth Israel, in the center of the crowded East Side. This is being provided with a new building that will have 500 beds, and the plans call for the installation of a radio receiving set with loud speakers in the auditorium, solarium, children's wards and in the open wards. Each private room is to be provided with a headset.

(*Continued on page* 44)

IS it possible to successfully give instruction in caricaturing, sketching, etc., via the radio telephone? An attempt was made recently from WJZ

Ruth Hammond

A Rising Young Commedienne and Caricaturist of Ability, Broadcasts Pointers on Her Art, and Extracts from Her Address Are Quoted Below

Miss Hammond in the stage success "Danger"

CAN the radio telephone be used to instruct students in the art of drawing, sketching, or caricaturing?

Snap judgment might make the answer "No!"

But wait—

It is the solution of questions like that which will, in the final analysis, determine how extensive a part radio will play in education.

For instance, could the drawing lesson in the What-not School at Four Corners be supplemented by an instructive lecture delivered from New York by Howard Chandler Christy? by Frueh? by Gibson?

An interesting experiment with this idea was made a short time ago at WJZ.

Ruth Hammond, one of Broadway's beautiful and rising young stars, journeyed out to the Newark broadcasting station and there spoke on the art of caricaturing, how her knowledge of it helps her in stage work and how others can profit by it.

Miss Hammond is a commedienne. Born and educated in sunny California, her career first took her to San Francisco where she held a part in a play at the St. Francis Little Theater. Then followed a year in a stock company, after which her two young eyes peeped from beneath a wealth of blond hair toward Broadway's Gay White Way.

Her first part in New York was in the titular role of "She Walked in Her Sleep." She played, also, in such productions as "The Ouija Board," "The Charm School," "The Skirt," "Danger,"—and this Fall she will be seen in "Weary Wives," a new production.

She has always been interested in caricaturing, and her work along this line has attracted attention. Newspapers from Los Angeles to New York have published her drawings. The *New York Times* published one only a few weeks ago.

This, then, is a brief sketch of the young woman who went to WJZ to prove her contention that caricaturing could be taught, in a way, by radio telephone. Her address follows:

By Ruth Hammond

You all know that a caricature is a grossly exaggerated cartoon-like drawing. You have seen them many times in newspapers and magazines, and, very likely, you have noticed two things: how really like the subject the caricature is, but at the same time how funny or humorous it seems to be. Not every artist knows how to caricature and at the same time it may be said that not every caricaturist is a sketch artist.

Like many other things, caricaturing is not, as many believe, "born in you." I knew how to caricature before I took up my stage work and it was not long after becoming interested in acting that I discovered that the two had a very definite relation to each other.

A caricature is a representation of a person with the main characteristics exaggerated. For example—just suppose you want to draw a caricature of one of your friends. Of course he has two eyes, a nose, a mouth, a couple of ears and some sort of hair—but how are these arranged that he appears to be different from some other friend? After you think you've studied him pretty well, close your eyes, and see if you can remember what impressed you most.

Did he have eyes like the eyes of a calico dog? Was his head shaped like a canteloupe? Was his chin vague—was his hair shiny—did his nose seem to point in any particular direction—were his eyebrows all bristly? For all these attributes, a snapshot will serve the purpose, but if he posses only one — exaggerate it humorously — make it express his personality, for after all, a caricature must express a personality accurately and a complete set of features is not always essential, in fact I often leave out a nose, or eyelashes or eyebrows—they are not expressive in all cases.

For the sake of continuing the example, suppose your friend was a pale lad with horn rimmed spectacles and a timid disposition—his hair stringy and shiny and because of his timidity he draws his head in—sketch him in profile with heavy spectacles and his chin resting on his Adam's Apple and use rather fine lines and don't make them dashing or bold. That would express him. But remember you must know what the characteristics are, what the personality is, before you can hope to express them in a drawing.

Now its the same with acting. If you are going to portray a character on the stage, first you must study the role and determine what kind of a character it is and then emphasize the main characteristics so that an audience in the theatre recognizes it and can get the mood of the play. There is a difference in the manner of expression of caricaturing and acting aside from the difference in mediums.

A caricature is an avowed exaggeration, but an acted characterization is not apparently exaggerated unless it is a ludicrous or eccentric one. It is emphasized rather, but it takes the same kind of close observation and study to prepare for a caricature as for a role in the theatre. Therefore, an actor who has trained his hand to record what his mind thinks, and his eyes sees, should make an excellent caricaturist or vice versa.

Haven't you ever seen an actor give a beautiful performance till he reached a certain scene and then he didn't ring true? It is as if he drew a picture of the character and put one eye in the middle of the forehead. Lenore Ulric's performance of Kiki shows that she is really a caricaturist. Whether she draws or not her work shows close observation and a final exaggeration and emphasis that "puts it over." And Doris Keane should be able to draw a very funny caricature of "The Czarina." Caruso was a great caricaturist and everyone knows he was a great singer and actor.

I'd like to make it clear that the

same observational study is the foundation for a serious portrait or a caricature; for a tragic play or a comedy. It is only the final expression that differs. Ed Wynn could read his lines in a way that would make his audience sob or he can exaggerate and caricature them and make them laugh, as he most certainly does. Charlie Chaplin could wear the robes of Hamlet and "ring true" every minute. Forbes Robertson could exaggerate and burlesque his Hamlet and be as funny as Fred Stone. Mabel Normand could play her roles as pathetically as Lillian Gish—all because their fundamental observations were accurate.

Study the Subject

To illustrate—suppose you were commissioned to draw a very small picture of an automobile. You thought you knew exactly how an automobile looked, but when you start to draw it you find you are not just sure of how the mud guards connect with the body and how the hub looks and how the hood hits the wind shield. However, the drawing is going to be small and rather than find out how these things really are, you "fake" the details and get an effect. Now you take this "faked" drawing and have an enlargement made of it. All the mistakes and faking are readily seen.

So it is with acting. Imagine you are an actress and your part in the play is that of a young girl, a lovable sympathetic character and the hero is supposed to choose you for his bride rather than the other girl whom everyone thought he would marry because he recognized better qualities and finer, truer instincts in you.

You read the part and say, "Oh fine, I'll wear beautiful frocks and hats and smile and that'll be easy." But suppose at the last minute the author decides to have you be a poor relation and wear shabby ugly clothes and unbecoming hats! Could you still maintain the sympathy of the audience? Would the leading man have any reason for choosing you? In other words, were you actually portraying a lovable character, or were you depending on your frocks and cute mannerisms?

To illustrate perhaps more definitely, suppose you place before you a photograph of Lillian Gish. To make a caricature from this photograph study it carefully. Note the expression. The position. The general effect. The expression could be termed infantile, ingenuous, appealing.

So, in caricaturing her, emphasize those qualities. Make a rough sketch, a general outline, taking care that even this rough outline resembles her. Do not try to fill any of the details. Eyebrows will suffice without attempting the eyes themselves.

(Miss Hammond illustrated this herself for The Wireless Age in a four-panel drawing herewith.)

A tiny dash for a nose, slanted in the right direction. Just the barest outlines, in fine lines. (No. 2.)

Then finish it. (No. 3.) Put in the curls, make the lines a little heavier where needed. Fill in the eyes, still using, however, outlines, two tiny circles for eyes, a little more of the nose, showing the tilt.

There you have what could be called a caricature. But it doesn't seem either simple enough or humorous enough, does it? Again study the photograph carefully. Make sure you have absorbed the *character* of Miss Gish. Then let your imagination have a free rein. Draw her in profile, accentuating the humorous pucker of her lips, the eyes turned toward the sky, and holding some object, a flowerpot, for instance, (as in No. 4.)

A caricature to have any value must look like the subject, no matter how distorted the features may be and a wistful character must provoke sympathy, whether the clothes be beautiful or ridiculous. It would never do to draw a caricature of Jack Dempsey and have one person think it was Bill Hart—and another, President Harding. It would be comparable to playing Little Eva and making the audience shriek with laughter in the death scene.

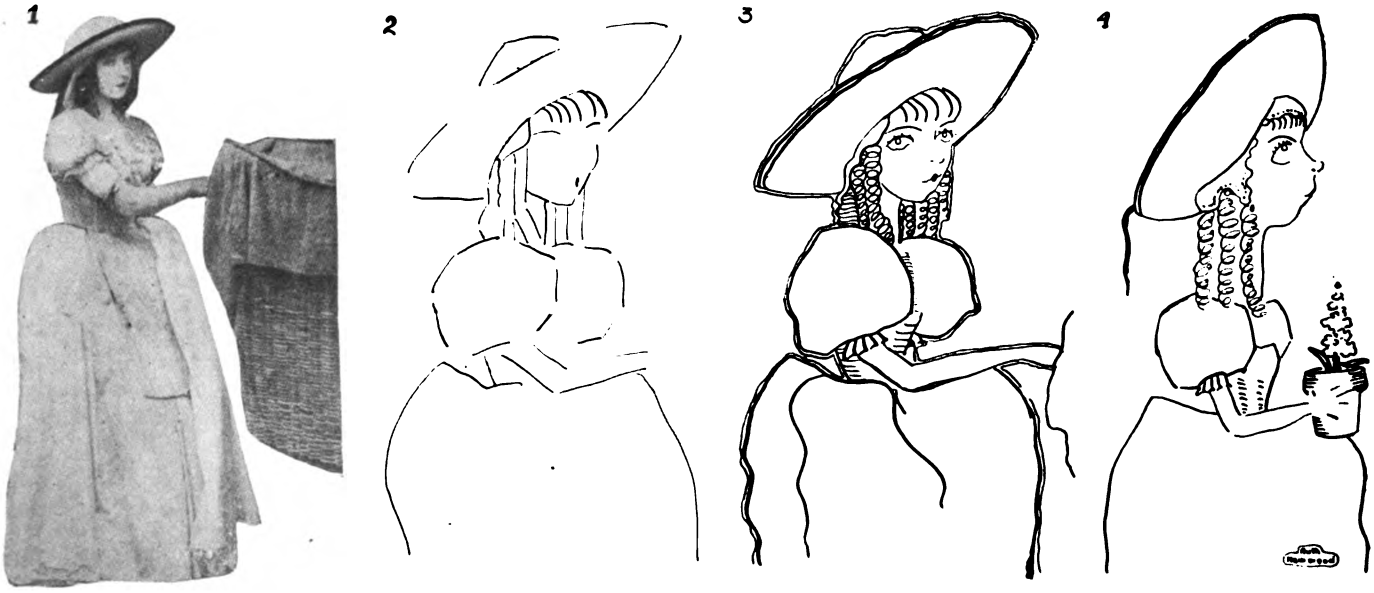
But it is not only on the stage that a knowledge of caricaturing will help. Persons who learn to observe the things that they see, a little more closely possibly than others do, always get more enjoyment out of living and always acquire a finer appreciation of life. Among the many thousands who are listening to me tonight I am sure there are many who have dormant within them the ability to caricature.

I might add that, quite aside from the pleasure that one gets from the knowledge of how to caricature, is the additional satisfaction of knowing that a good caricaturist gets paid and well paid for his work.

Will Criticize Efforts

Do not use your eyes simply to look with. Use them to see and observe with. Try yourself—practice—and then send me, care of WJZ, a sample of your work and I will do my best to give you suggestions that might help you.

Officials of all broadcasting stations are awaiting with interest the results of Miss Hammond's suggestion that radio fans send her samples of their work. If these show results which compare favorably with the drawing Miss Hammond made for The Wireless Age, officials believe a step forward will have been made in radio history.



Caricatures of Lillian Gish drawn exclusively for The Wireless Age, by Miss Hammond. She believes it possible to give lessons in this art over the radio telephone and in the accompanying article explains the various steps an artist must follow to achieve success

“SUPPOSE a bride doesn't know the difference between a scrambled egg and a kippered herring? It is a simple matter for her to tune in with an expert somewhere and unravel the mystery”

Eddie Cantor

The Funny Man of the Musical Comedy Stage Makes Even H. N. Lee, His Hardened Interviewer, Chuckle

Eddie Cantor in Character

EDDIE CANTOR is funny. He admits it. We all know it. By virtue of his being funny he justly earns what is commonly believed to be one of the biggest salaries in the theatrical world. The said Cantor weekly stipend is made possible because whenever his magic name appears above the theatre it attracts, vastly, the *hoi polloi.*

It was only natural then that those who guided the destinies of radio in its pioneer stages in the East, wanting theatrical headliners to appear, should have found their way to Eddie Cantor. They did, and Eddie Cantor was “put on the air.”

The radio audience that night laughed long and loud. They say that if all the applause that was given in the hundreds of thousands of homes into which Eddie's voice went could have been assembled into one mighty roar, the polar bears away up north would have heard it.

Do you remember how Eddie, after he had exuded a few choice songs, ruminated into the microphone: “Let's see now, there must be something like a hundred thousand persons listening to me. If each one of them would send me a dime———”

In the next day's mail which the star received at his home in Mount Vernon—for he gave his real home address to the radio fans—were about four hundred letters and in those letters was assembled the most miscellaneous mass of trinkets, foreign exchange, collar buttons, shoe strings, checks and coins that a man ever was privileged to gaze upon.

One conscientious radio fan sent a check for eleven cents, adding in a postscript that the extra cent was for war tax. Another youth, reeking with humor, sent a check for five cents and the letter with it told Eddie that he had only been able to hear half of his songs and that therefore he felt that Cantor was only entitled to half of the amount that he had, in jest, suggested that the fans send. Every penny that came in in this way through Eddie's jest was sent to the Red Cross.

When the public goes to the theatre it only sees Eddie Cantor across the footlights and never is privileged to go behind the scenes. I wanted to take the radio audience there to meet Mr. Cantor. When I telephoned him in his home at Mount Vernon he suggested that I see him in his dressing room at the Winter Garden on Broadway. A few nights later I arrived at the stage door at 9:45 p. m., which was the hour that he had told me he would be off stage.

“Go right up stairs and turn to your right” said a stage hand when I told him that I had an appointment with Mr. Cantor. I commenced an ascent up an iron stairway and had only reached the first landing when Eddie Cantor himself descended.

“Go right on up to room number five,” he shouted to me as he hurried past. “I will be off stage in a few minutes.” I thought he said room five, at any rate; but when I reached the proper floor I discovered that room five was not Mr. Cantor's room, but was a room set aside for the exclusive use of the young maidens of the chorus. One of the beauties who had just emerged from room five told me that Mr. Cantor's room was number four, right next door. There I was greeted by his valet, Benny, a good-hearted and polite young colored man.

It was not long before Eddie himself hopped back into the room for a change of costume.

He had been thinking rather seriously of the radiophone for he immediately plunged into the subject vigorously.

He repeated what other stars have told the writer, that his speaking into the microphone had given him the biggest thrill that he had ever had in his life. He pictured the people who must have been listening—the millionaire and his fellow club members, the tenement house dweller, the backwoodsman, the young, the old.

But he did not stay on a serious subject very long, for shortly he was telling me that undoubtedly the radiophone would play havoc in the lives of husbands who telephone their wives that they have business appointments when the said business appointments consist of poker games.

“Why,” exclaimed the star, “all the wife may have to do to find out where her wandering husband is, will be to tune in something or other and listen.

“And then there is the wonderful possibility that the radio telephone will help a bride. Suppose a bride didn't know the difference between a scrambled egg and a kippered herring. In such a dilemma she could tune in and ask an expert how to scramble the egg, and what to do to kipper the herring.”

Cantor believes that as a medium to disseminate entertainment the radiophone never will become one hundred per cent. popular for he thinks that much of an entertainer's power lies in his physical appearance.

“But as a means of creating interest in persons or things,” the star said, “it stands in a class by itself. Of the people who wrote letters to me following my broadcasting, twenty-five per cent. had never seen me on the stage. They assured me that, should the opportunity to do so ever present itself, they would avail themselves of it.”

The conversation ended here because Cantor had to appear in another scene of the production “Make It Snappy.” While he had been speaking, he had been working away with his make-up and now that the time had come to leave his room for the footlights again, he was the black-face Eddie Cantor who sends his nightly audiences into roars of laughter.

KDKA

How the Nation's First Regular Broadcasting Programs Were Started in East Pittsburgh by the Westinghouse Elec. & Mfg. Co.—A Word Trip Through the Studio

ON October 1, 1920, a meeting of four persons was quietly held at the East Pittsburgh plant of the Westinghouse Electric and Mfg. Company. Neither trumpets nor the beating of drums heralded the little gathering, which time was destined to cause to make radio history.

At the meeting were Harry P. Davis, vice-president; Frank Conrad, an engineer, M. C. Rypinski, sales department, and J. C. McQuiston, manager publicity department.

The story goes that it was Mr. Conrad who called the meeting. He suggested to the other men that the experimental radio telegraph station at the plant be utilized to transmit telephone messages, so he could undertake advanced experimental work on the apparatus of his home station.

Mr. Conrad remarked, it is said, that should such a station be opened to transmit the voice, it would be easier to make home experiments and that the cooperation of all radio amateurs would be secured.

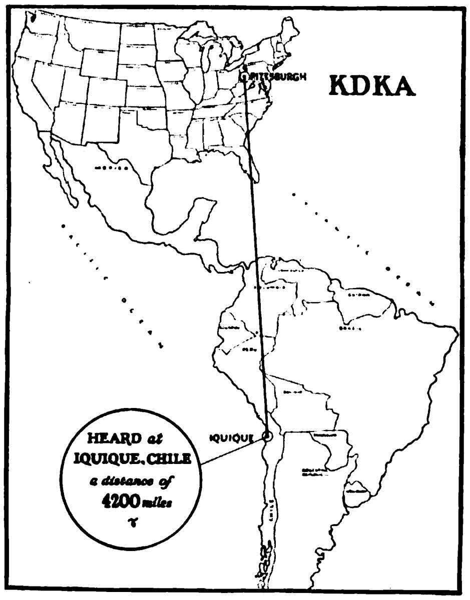
It was Mr. Davis who hazarded the opinion that possibly the general public would be interested in the idea, and he asked what Mr. McQuiston thought. That individual painted the picture of the farmer alone on his farm, far from the theatres, one or two days away from the current newspapers, and he wound up by declaring his belief that the results of broadcasting such as suggested would have an effect of which those at the meeting had little conception.

"But," he warned, "it must be kept up every day in the week, and the programs sent out must be continually improved."

Mr. Davis, so the story goes, looked around the meeting with some little satisfaction, and said:

"We seem to be of one opinion regarding the feasibility of starting a station, and so we'll do it."

Those words brought the now famous KDKA station into being, but it was little thought then that the transmission of presidential election returns from this station, which was then known as 8ZZ, would result in the widespread interest in radio that is now present throughout the country. The persons who were in close touch with the station, however, were quick to realize the tremendous possibilities of radio broadcasting and immediate steps were taken to develop fully this service.



KDKA has had the distinction of being heard in far-off Chile, a distance of more than four thousand miles

Permission was obtained from the Government to broadcast each night, something not heretofore thought of by radio operators anywhere.

A keen foresight was aroused. Radio broadcasting was seen as a means of disseminating entertainment, information and education for thousands of miles; from the big centers of music and art to the outlying districts lacking such benefits; from points where national news develops to lonely, inaccessible places; from educational institutions to isolated communities without the advantages of higher education; from the largest churches of the city to the farm and ranch miles away from the nearest place of worship.

All these possibilities and many more were foreseen and means were taken so as to develop the broadcasting from station KDKA that these many benefits might be obtained. For this reason a history of the development of the programs and the equipment of this, the first broadcasting station to give nightly concerts, is a history of the development of radio broadcasting itself. This statement is more significant when it is known that KDKA was operating for over ten months before another station was installed to give an entertainment every night.

When this broadcasting station was formally opened on the night of December 21, 1920, a handful of records were taken to the "studio," at that time a room which would hardly accommodate more than three persons. It was announced that station KDKA would give a concert, and then the records were played. No announcement was made of the names of the selections, such as is the custom at the present time, and it was left to the operator at the receiving end to rack his brain to recognize the number. This lack was soon recognized, however, and the name of each number was announced.

An evidence of what radio broadcasting could do for the already established sources of entertainment was immediately brought out when the music stores in the district were swamped with requests for records that had been played by radio.

Thus, a direct benefit was obtained by the record makers and the music stores. The reason for this was seen in the fact that most of the records brought to the attention of the public in the past were only the popular ones and that the best records played by the leading musicians of the time rested on the store shelves. Their sales were slow, in comparison with the latest popular music, demand for which was stimulated by being played in every cabaret and theatre. KDKA gave the public the best class of music, even if this did not meet with immediate popular demand.

During the first few months of broadcasting from KDKA phonograph records were used exclusively, and when picked with care were very satisfactory. However, it was thought that the radio enthusiasts would like to hear the local artists, and also some of the internationally prominent musicians who gave concerts in Pittsburgh. Many of the artists of Pittsburgh requested to be allowed to visit the radio station and perform by the new and novel radio method. Of course, the station was at first without facilities to take care of the artists in person, but a piano was obtained and crowded into the radio station. The first concerts were so popular that a temporary studio was built and arrangements were made to establish a permanent studio near the radio outfit. This was the first studio ever built for the exclusive purpose of broadcasting radio entertainments.

It was a room twenty by thirty feet,

entirely covered by burlap in order to overcome the possibility of any echo.

It is now often wondered how it was possible, only ten days after the station opened, to broadcast by radio the services from the Calvary Episcopal Church in their entirety. This was accomplished on January 2, 1921, and was the first service ever sent out broadcast by radio from a church.

Transmitters were installed in the choir loft and for the preacher in the pulpit, these transmitters being connected by telephone lines to the radio station KDKA, which is some ten miles distant. The transmitters picked up the clear tones of the organ, the blending voices of the choir of sixty men and boys, and the resounding voice of the preacher as he delivered his usual sermon.

Of course, the radio operators had to strain their ears in order to hear every word of the minister, Rev. Edwin J. Van Etten, Rector of the Calvary Church of Pittsburgh, but the idea of receiving a church service in the home was so distinctly novel that their enthusiasm could not be expressed in words.

For the next Sunday's service, a different arrangement of transmitters was tried, and all during the week experiments were made to better the service. The organist and the choir, as well as the minister, gave rehearsals several times during the week, so enthusiastic were they.

After the second service, equalling the success of the first, which brought forth many laudatory letters and comments from the radio listeners, the engineers decided that they could still improve the service. From that day until this, the KDKA radio engineers have been working continually on the subject of transmission of church services, and although the ultimate perfection has not been reached, one can well imagine oneself in church, hearing the service direct, so realistic is the transmission.

In order to comply with the requests from so many churches to have services broadcasted by radio, KDKA Radio Chapel was established on Sunday afternoon December 11, 1921. The minister and the church choir visit the radio station on Sunday afternoon and conduct the regular service for the benefit of the radio enthusiasts. In this way, each denomination has its turn, and now it can be said that practically every church of the major denominations has had its opportunity of conducting a radio chapel.

Where melody heard by thousands in the Middle West is born—the KDKA studio

Shortly after the radio station started, arrangements were made with the United Press Association to obtain the latest headlines of the day's news. These headlines are broadcast each evening, and are an added feature to the program. In addition, arrangements were made early with the United States Bureau of Markets, Department of Agriculture, to broadcast the grain, fruit and vegetable and live stock market reports. A review of the New York Stock Exchange was later added to this news report. The value of this service to the city man and the rural resident was early realized, and additions to the broadcasting news service are made from time to time.

And then the children were considered. Special bedtime stories and music were provided, and these are broadcast every weekday night.

The technical equipment at the station is, of course, the most complete. The antenna at KDKA consists of 6 wires, 190 feet in length on 20 foot spreaders. The antenna is supported 210 feet above the ground by a brick smoke stack at one end and by a 100-foot pipe mast on the 9-story building at the other end. The operating room and studio are located on the 9th floor of this building.

A counterpoise, which is a duplicate of the antenna in construction, is placed 110 feet beneath the antenna. This brings the counterpoise about 15 feet below the transmitting set. The down lead from the antenna and the counter-

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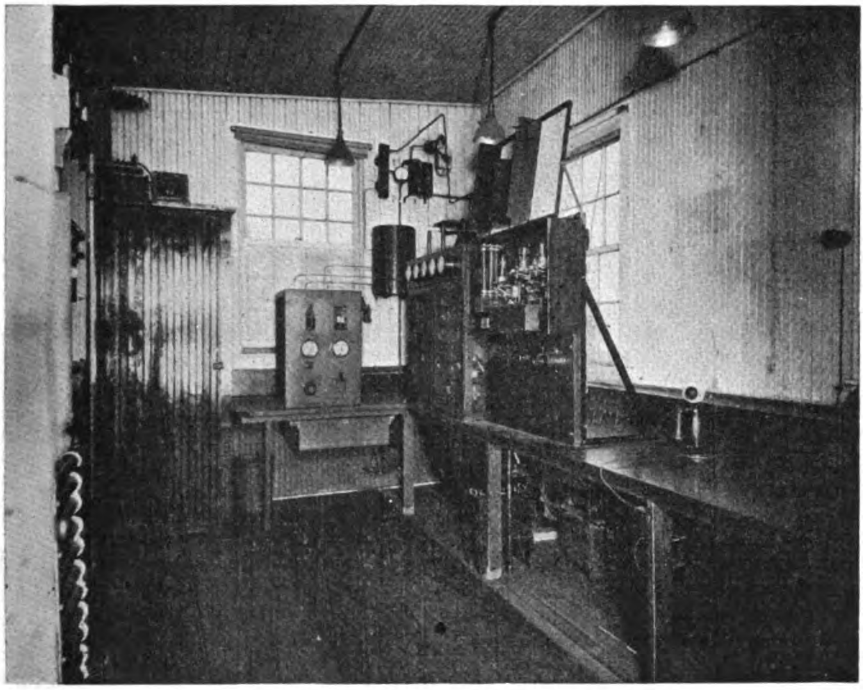


This photo shows the transmitting apparatus at the Radiophone Broadcasting Station KDKA at East Pittsburgh, Pa.

Leonard--Britton Bout

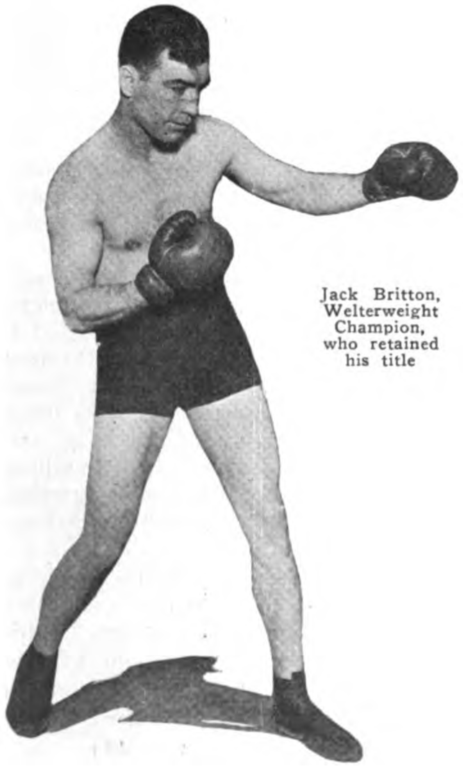
(*Continued from page* 30)

We have "witnessed" two boxing contests over the wireless, the one last night between Benny and Jack and the heavyweight contest last year between Dempsey and Carpentier.

To all intents and purposes we might just as well have been right at the ringside in both cases, so far as was concerned our ability to follow the scraps blow by blow and get the real thrills that go along with this sort of entertainment. The announcer was very vivid in his descriptions as the bouts progressed and we could hear plainly the great cheering of the crowds as well as the bell at the ringside.—Henry E. Marschall, *East Orange, N. J.*

I for one should like to have more of this nature, for it is very interesting, especially in large fights between well known boxers.—L. D. Mudgett, *Shirley, Mass.*

It was certainly great—one of the best things I have ever heard on my outfit, and I have heard some pretty good things. I could hear the announcer distinctly all over the room through the phones, hear the gong between every round and the applause would nearly deafen you. There was quite a bit of static but the announcer's voice came in good and plain and as I say perfectly understandable. I was in from the second round and was sorry it ended in such an abrupt manner. Had I known it was going to be broadcast I should have been on the job from the beginning. The announcer surely did good work in the contest and it was next thing to sitting by the ringside—in fact, I enjoyed it better and there was no trouble in imagining you saw the match, so well did the announcer give every detail.—I. H. Kattell, *Binghamton, N. Y.*



Jack Britton,
Welterweight
Champion,
who retained
his title

While listening in on my radiophone Monday evening, I happened by chance on your broadcasting the Benny Leonard fight. I want to tell you how wonderful it all was. Your man who broadcast was really wonderful. It seemed as if I was right there at the ringside and saw it all. I could hear the gong sound and the cheers of the crowd and also the whistle as plainly as if I were there.—J. W. Cadden, Treasurer, The Plaut-Cadden Company, *Norwich, Conn.*

Please permit me to say that my wife, little boy of seven, and girl of twelve and myself all enjoyed the splendid broadcasting of the Britton-Leonard fight from the ringside. Everything came in clear as a bell. We could hear the gong and the cheering of the mob, the announcer, etc.—Albert L. Plessis, *Flushing, L. I.*

My family, my friends and myself were very careful and anxious listeners and we enjoyed every word of it. I may say that my nerves were at the same pitch as if I had been sitting in the first seat of the Velodrome, the report was so realistic.—Dr. Jno. J. Peckelis, *Newark, N. J.*

The Britton-Leonard contest was followed round after round by five interested listeners through the medium of a simple crystal set. Mr. White's enunciation was perfect and his descriptions were very clearly given.—E. M. Johnson, *New York.*

There was a crowd of us listening in and we heard each word perfectly—heard the gong plainly at the beginning and ending of each round—could easily distinguish the noise of the crowd at the Velodrome, and we could even make out the voice of Mr. Humphreys, the announcer.

I think the plan of broadcasting boxing matches is wonderful and is the next best thing to being present at the ringside. You can count on my vote and the vote of my friends as being enthusiastically for it.—Lester Gabriel, *Rye, N. Y.*

We received the broadcasting of the Leonard-Britton fight in New York with perfect clearness. As we are located in extreme northern New York about twenty miles from the Canadian border we consider it remarkable.—Nicholville Home Tel. Co.,
C. D. Babcock, Owner and Manager.

The description of the fight was very clear and it is the hope of the many listeners that were guests of my son last night for a repetition of the next big fight.

My son, being a cripple, gets a wonderful amount of enjoyment from all returns.—Daniel J. Fullerton, *Brooklyn, N. Y.*

Have had a radio outfit for several months and have enjoyed your concerts and the various efforts you have made to entertain your audiences. I have often thought of writing you to express my appreciation but somehow have never gotten to it, but today I feel so enthusiastic about the ringside report of the fight and want to tell you that a small audience in my rooms enjoyed it to the limit and we wish to express our thanks and hope that you will have sufficient encouragement from you audience to do it again and often.—Dr. A. G. Lane, Clinical Director, *New Jersey State Hospital at Morris Plains.*

Benny Leonard,
Lightweight
Champion,
who lost

Just a line of appreciation of your efforts in so clearly and carefully pronouncing each word of your report of the contest last night. You certainly handled your end of the affair in splendid shape and it was a very enjoyable evening all around. I could hear the many cries of the crowd, etc., which was very interesting.—Andrew Wallace, Jr., *Brooklyn, N. Y.*

It certainly was a dandy entertainment. The family enjoyed it immensely.—J. V. Finan, *New York.*

I had four of my neighbors in, and they also enjoyed the service you so kindly rendered.

Keep it up, it's fine.—W. J. Donovan, *Newark, N. J.*

The announcer's description of the fight was perfect. I trust more sporting events will have your consideration for broadcasting.—Udo M. Reinach, Secretary Schulte Retail Stores, *New York.*

The returns were very realistic, due to the wonderful and competent way the announcer made his delivery of the fight direct from the ringside. Radio will become dearer and closer to us as the years go by, if this class of broadcasting is lived up to. At times you could almost hear the crowd cracking the peanut shells and with cheering of the crowd and the ring of the gong all one had to do was to shut his eyes and be simply carried to the fight, to feel as if he was at the ringside. "I want some more."—Charles H. Tisserandy, *Newark, N. J.*

While listening to you broadcasting the Benny Leonard vs. Jack Britton fight Monday night I wanted to tell you it was so good that it seemed to me that I was right there.

I am crippled and cannot go out and I enjoyed it very much and I think that you cheer other shut-ins like me.—Fred Baechler, *Newark, N. J.*

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"I Take My Pen in Hand to Tell You—"

Correspondents Report Their Pleasure and Profit in Broadcast Programs. Each Home Finds New Reasons for Listening In. Gratitude Moves Many to Express Their Appreciation in Written Words of Thanks

Our little girl has to go to bed early at night and of course it is impossible for us to trot off to places of amusement. There are thousands of others in the same boat and I am sure that the radio programs sent out by you have been the means of making the evenings spent at home much more enjoyable to those who take advantage of them than they ever were before.

George MacArthur,
Washington, D. C.

I have 320 children somewhat under my care at the Leake and Watts Orphan House at Yonkers, N. Y., and I have recently organized a Radio Club. After our brief business session of last evening I connected up two pair of head sets and each member of the club had several chances to listen in. The entertainment was greatly enjoyed by all, and the entire radio club instructs me to convey its thanks and appreciation to WJZ. Later, when we get a larger receiver and loud speaker our entire family of several hundred children will be able to have the entire program.

Robert S. Tucker,
Yonkers, N. Y.

Last week while you were playing that snake charming music, my outfit went dead, and when I looked at my aerial I found a snake on my lead-in, so you see music hath charms. The snakes are full of electricity—who knows they might have receivers.

J. L. McPherson,
R. F. D., Shelton, Conn.

We are middle-aged people to whom the movies do not appeal and it is a real pleasure to sit quietly at home in the evening and listen to good music and interesting talks such as you are sending out, especially as my husband's eyes will not allow him to read much in the evening.

Mrs. E. W. Beach,
East Orange, N. J.

Send your impressions in the form of a letter to The Wireless Age. Be sure to tell about your more interesting and unusual experiences. Write on one side of the paper, not over 300 words. Address them to Letter Editor, Wireless Age, 326 Broadway, New York City.

In order to show my appreciation and encourage this new and most wonderful discovery, I will be glad to subscribe $25.00 if you can get nine others to do the same, to donate a big radio machine to some orphan asylum in New York. Seems to me this could be "sold" to the "fans" by an announcement over your service.

Joseph A. Klein,
New York.

Just a word to let you know that I have received your radio concerts recently and was pleased, only I could not hold you on account of other cities nearby operating at same time. We hope to hear your concerts again. I have a two-step amplifier and receive concerts from KDKA, WPB,WGY, WWJ, WCX, WGR, also from NOF Naval Station at Anacostia, D. C.

Arthur Lee Ross,
Port Elgin, Ont., Canada.

Please accept thanks for the very excellent radio programme which my family and some friends had the pleasure of listening to last evening. This town is situated in the Ottawa Valley, about two hundred and twenty-five miles north-west of Montreal, but the transmission was perfect and left nothing to be desired. I only fitted up my apparatus on Saturday last and your concert of Sunday night was the first we had the opportunity of listening-in on.

E. A. Dunlap,
Pembroke, Ont., Canada.

I think your concerts are very good indeed; you speak very plain. Could you tell us where we can get a bulb? We cannot hear your concerts now as we have no bulb. We are very anxious to hear your concerts, too, as they are very good. I always enjoy them as I am only eleven years of age and I just love music. I have a brother and mother and father who enjoy the concerts very much.

Madeline Hagen,
Brooklyn, N. Y.

Having just taken the receivers from my ears, I wish to say that merely writing a letter to you can't come within a thousand miles of expressing the joy and pleasure I find, also the rest of my family, in being privileged to sit night after night and listen to such grand concerts and such entertaining and instructive talks.

It surely is the wonder of the age as it hardly seems possible that with a few feet of copper wire wound on a pasteboard tube and a few other little insignificant things one is able to hear a male quartet humming a few miles away, as I heard tonight. It's almost uncanny, but it's a fact.

I met with considerable opposition at first, on account of expense, and the time devoted to the construction of the bunch of junk (apparently) which reproduces the entertainment every night, but now almost every time I want to listen in mother has beat me to it, and of course now dad has to wait. My kid goes to sleep every night with the receivers on his head, then Dad sneaks in and listens to the tag end. Its great, wonderful!—and I wish to personally thank you or whoever is responsible.

C. G. Smith,
East Orange, N. J.

At my home here in Clifton we have four simple crystal sets that have received several different radio stations. Three sets are installed in bedrooms and one in the living room. While convalescing from scarlet fever—for which reason I dictate this letter—I am enjoying listening to WJZ's broadcasting in detail. It seems as though you are using a wonderful opportunity to put over things to the public that they would not listen to otherwise. The "Milk Bottle" talk was fine. I like your idea of religious service on Sunday afternoons, and wish there could be even more of the good sacred music.

William A. Robbins,
Clifton, N. J.

Radio Relief for the Ailing

(*Continued from page* 36)

This radio service will be part of the hospital treatment, and will be given without extra charge.

L. J. Frank, superintendent, states: "The effect on the patient is bound to be good, and will in my opinion facilitate his recovery. It will be of special value to those patients who will be in separate rooms, as it will obviate lonesomeness when there are no visitors. It will also be of help to cases of chronicity, where the patients are required to remain in the hospital for a long time."

The New York Post-Graduate Medical School and Hospital likewise intends to utilize radio. S. H. Wadhams, executive officer told me: "Steps have been taken to install a radio service for the use of the patients in our wards. How extensive this installation will be will depend upon the generosity of the benefactor who has volunteered to pay for the installation. You may depend upon the Hospital's interest in the possibilities of the radiophone as an assistance in solving a feature of the nursing problem that confronts it."

Dr. A. J. Barker Savage, superintendent of the Broad Street Hospital, told me that a complete radio installation is to be made in the new building for which the hospital recently secured funds. "We want to do anything that will add to the patients' happiness," said Dr. Savage, "and radio will do it as nothing else can. I am very much in favor of it." The hospital is located in the financial center of New York City, and its list of directors is an imposing one, including some internationally-known names of prominent financiers. The expense of the radio equipment for the new hospital will be borne by the directors, who pledged their support after listening to a vigorous plea by Dr. Savage at a recent meeting of the board.

Many of the Government hospitals in which are wounded and disabled veterans consider radio to be vital in improving the mental condition of their patients. The Fox Hills Hospital was one of the first to utilize radio, securing a Signal Corps set, and other hospitals in all parts of the country followed suit. The local posts of the American Legion in many cases raised the funds for the radio equipment. In El Paso, Tex., the Veterans of Foreign Wars only recently provided the William Beaumont Hospital there with receiving equipment.

Probably there is but one handicap to radio from the doctor's point of view. That is the fact that the best and most interesting concerts are broadcast after eight o'clock at night. Several doctors told me that this was just the hour when they expected their patients to be settling for a long sleep. "Give us more concerts in the afternoon," they pleaded, in substance. "The phonograph records are fine, and they come over well, but the major interest is in the personal performances that take place in the evening. In many cases the effect on the patient is well worth an extra hour or so of sleep, but if that effect could be had in the afternoon instead of the evening it would be even greater."

Which is respectfully submitted here to the broadcasting stations, with the hope that they may increase their already great humanitarian work for those who are ill.

KDKA

(*Continued from page* 41)

poise lead are made up of 8 strands of No. 14 copper wire equally spaced around 1½ in. diameter wooden spacers. The natural period of this aerial system is approximately 412 meters. A series condenser of .0005 mfd. capacity is used in series with antenna and sufficient loading inductance added to obtain the desired wave length of 360 meters.

A series condenser is shunted by the radio frequency choke coils of 10 millihenries inductance in series with a megohm resistance, to drain off any static charge that might accumulate on the antenna when insulated from the ground by the series condenser. The high frequency resistance of the antenna system at 360 meters wave length is approximately 12 ohms, a large percentage of which is radiation resistance. The antenna current at 500 watts is 6.5 amperes and at 1 kw. 9 amperes.

The power equipment used at KDKA consists of two 2 kw. motor generator sets with 250 volts D. C. motors. The generators are of special design for 2,000 volts D. C. employing two armature windings and two commutators permanently connected in series.

Radio Helps Sell House

WHEN he found that a house in Dallas, Tex., while in good condition, was not modern enough to attract good bids, a real estate operator there installed a radio receiving set and advertised that it would go with the house. Advertisements in the papers brought many replies, and he sold the house at a profit.

Leonard-Britton Bout

(*Continued from page* 42)

Our entire family listened in. Andrew White's announcing—amidst the continual uproar and din of the enthusiastic boxing fans assembled at the Velodrome—was perfectly audible. We thoroughly enjoyed his introduction and discussion prior to the commencement of the contest; that is, his comments as to the notables present and other information such as Jack Dempsey's Palm Beach Suit; his detailed and intelligent point-to-point presentation of the championship contest itself; and his final announcement of the most unfortunate conclusion of the contest. In fact, we "ate" every word that came to us over the phones!—Beatrice E. Weiss, *Newark, N. J.*

On behalf of the radio fans of the New York Fire Department, permit me to congratulate you. It was an excellent description, vividly described, and those who were fortunate enough to possess a wireless equipment in the different fire houses were highly elated over the success of this feature of your broadcasting.

Trusting you will experiment further along this line, I remain—Val Fendrich,
Chief, Bureau of Fire Alarm Telegraph,
City of New York Fire Department.

We received your broadcasting of the Leonard-Britton fight very clearly and distinctly. After I put my hat on to go to the store, I walked 100 feet and a young man called out of a window to me that Britton had won. I went two blocks to the bakery and two men were having coffee, also an argument over Mr. Haley's decision of the fight.—Mr. and Mrs. Grant, *New York.*

I beg to take this opportunity of complimenting you on the very excellent broadcasting of the details of the Britton-Leonard fight. I received every detail perfectly. I could even hear the whistle and gong and the cheers and comments at the ringside.—Fred N. Bunger, Director, *Lutheran Hospital of Manhattan.*

On behalf of about seventy-five or more enthusiastic fight fans who gathered at our place of business last night to hear the returns of the Leonard-Britton fight, we wish to thank you and those responsible for the broadcasting of this most interesting event.

The manner in which the bout was described was indeed very interesting and with the exception of the fact that we could not actually see what was going on, it was expressed among those present that it was the "next best thing to seeing the real fight."—D. A. Sanders, *Nyack, N. Y.*

We want to compliment you in the highest phrase on the clarity of your announcer, whose enunciation is splendid and whose nerves must be of cast iron to broadcast in the cool manner of his delivery. At the time, in both places, were other receivers than ourselves and our guests were highly enthused and I am sure they all will be "fans" due to this spendid work on your part.—R. V. Colton, Pres., H. Schwerin, Secy.,
Vernart Mfg. Corp.

What Radio Means to the Blind

Institutions in All Parts of the Country Tell The Wireless Age of Radio's Immense Value to Them—Great Field for Radio Fans' Charity—Every Blind Person Should Be Within Reach of a Receiving Set

THERE is just one big charitable thing that the readers of THE WIRELESS AGE can do and that is provide funds for the installation of radio receiving apparatus in their local institutions for the blind. Radio for the blind is a humanitarian enterprise carrying benefits such as no other modern activity possesses for them, and every blind person should be able to profit to the fullest extent from it.

Such was the conclusion when Ward Seeley's article, "Radio Blesses the Lives of the Blind," was submitted for publication in the July issue, and ample confirmation has come since then. Many organizations for the blind have written their appreciation and told of their great desire to bring the music, news and entertainment of the world into the lives of their people by radio.

From all parts of the country have come new tributes to the service of the radio telephone to the blind, who find that for the first time in all history they can be just as up-to-date and well informed as sighted persons, and at no annoyance to others.

What is probably the most progressive and best known of all institutions for the blind is the Pennsylvania Institution for the Instruction of the Blind, at Overbrook, Pa., which has been doing some quite remarkable educational work. O. H. Burritt, principal, writes as follows:

> We have no means of knowing just how many blind in Philadelphia and its environs have installed radio receiving sets, but we do know that a number of them have done so and that a very considerable number would welcome the installation of receiving apparatus that would permit them to keep in touch with current events and listen to music, lectures, sermons and all material that is being broadcasted. You can readily see that the radio receiving apparatus is a great boon to blind people and will keep them in touch with the movement of modern life.
>
> An extremely important factor in making this invention available for blind people is to bring it within their reach financially; for a great majority of blind people are themselves poor, or are members of families that have little to do with.
>
> So far as this school is concerned, we have been looking into the possibilities of installing a receiving apparatus that will meet our needs. We haven't gotten very far with the plan; partly because we have not yet worked out a satisfactory method of installation; and, partly, probably chiefly, because of the cost of installation and maintenance.
>
> It is probably true that radio may prove to be a greater boon than the invention of Braille type. However, I doubt this statement. The truth seems to me rather to be that the invention and perfection of radio apparatus is a very helpful supplement to the embossed page. It is also probably true that, granting the perfection of radio apparatus and its production at a reasonable figure, a larger number of blind people can, through this medium, be just as up-to-date as any one else—which is utterly impossible under the existing conditions because of the expense and time involved in the production of embossed literature.
>
> We have a blind population in this institution of two hundred. We are very much interested in the installation of radio receiving apparatus and shall install such as soon as we can find a satisfactory outfit that is within our means.

This excellent letter is typical of the situation in the great majority of organizations working with blind people. Lack of funds prevents them from immediate realization of their desire to give their people the great benefits of the radio telephone. The several institutions that already have receiving sets are enthusiastic. S. M. Green, superintendent of the Missouri School for the Blind, St. Louis, writes as follows:

> We installed a radio receiving set in February and have found it of the greatest possible interest to our pupils. It helps to solve the one ever present problem of keeping the blind in touch with current events.

Another school that has been provided with apparatus is the Connecticut Institute for the Blind, Hartford, whose superintendent A. L. Curado, writes:

> We have a large size Westinghouse wireless outfit with Magnavox and two steps of amplification which has proved very satisfactory and has given a great deal of enjoyment to some of our blind people.
>
> We also suggest that some special method of teaching the average blind person the international wireless code be discussed in your paper.

Blind girls in the New York Lighthouse for the Blind, which has just been presented with a receiving set, are fascinated with it

In reply to the last paragraph of this letter it was pointed out that the Marconi-Victor wireless code instruction records are ideal for teaching the blind.

Several schools are now installing instruments, and have not as yet had time to operate them. The Florida School for the Deaf and the Blind, St. Augustine states:

> We are now installing two receiving radio sets in this school for the benefit of our blind people. We hope to have these sets ready and in operation before the opening of the next term of school.

From the northern border of the country comes almost the same word, H. J. Menzemer, President of the Montana School for the Deaf and Blind, Boulder, writing:

> We are a small school and do not feel that we can afford a very expensive outfit; but we do hope to install one during the coming year and this, we hope, will take the place of newspaper reading, and also the place of concerts of which our little town affords all too few. We have twenty-eight in our Blind Department.

In Iowa, the Iowa College for the Blind, Vinton, is considering an installation, and is still studying the possibilities, particularly financial, for F. E. Palmer, superintendent, has no doubts of the great assistance radio is to the blind. He writes:

> I am very much interested in the proposition of installing a receiving set at the Iowa College for the Blind, and I shall recommend that such installation be made providing the cost is not too great.
>
> We have about one hundred and fifty people here who would take advantage of such a service, and I feel sure that it would be of real service to the blind.

(*Continued on page* 96)

What Newspaper Editors Say

Press Comment Shows Public Attention Is Focused on Programs Rather than on Mystery of Radio Itself

ARE people more interested in the mysteries of wireless itself, or in the material broadcasted via the wireless telephone?

An interesting question, likely to provoke debate whenever asked. It has been asked many times recently in the nation's press, many editors have commented upon it. The opinion of the majority of them seems to be that the people now are more interested in what is being given them over the radio telephone, than in the radio telephone itself.

There was a time, they say, and not many months ago, when the reverse was true, but the novelty has worn off, they add, and such an attitude exists no longer.

This confirms the opinion of the writer of the article on the successful broadcasting of the Leonard-Britton boxing exhibition in New York City, which appears in this issue of THE WIRELESS AGE. He maintained that in the course of his observation of New York crowds he was impressed with the fact that the people were more attentive to the results of the boxing match than to the radio telephone.

But the *Bucyrus (O) Forum* believes the opposite is true. Headlining an editorial "A Radio Mystery" it says:

> What the radio fans really are interested in, is the mysterious wireless itself, rather than what they hear by Hertzian waves.
>
> The wireless has a basic and universal appeal because it is closely allied with the supernatural, even the uncanny.
>
> The history of wireless began 70 or 80 years ago with the experiments in electromagnetic induction by Faraday, an Englishman, by trade a bookbinder.
>
> BIRTH OF RADIO
>
> Heinrich Hertz, German professor, came along later and in 1886 made amazing discoveries about an electric spark bridging a gap or break in a wire.
>
> Scientific minds immediately began working on the problem of making the electric wave jump thousands of miles instead of an inch or so.
>
> People discussed the sanity of Sir William Crookes when, in 1892, he predicted the coming of actual communication by wireless.
>
> In 1901 Marconi, brilliant young Italian, sent the first wireless messages across the Atlantic—the letter "S," in code.
>
> Many readers will recall the wireless telegraph craze that followed among boys—also their antiquated equipment including the coherer and decoherer, which few youthful radio fans of 1922 ever heard of. Radio equipment now in use will be just as obsolete, 21 years hence.

Assuming the other attitude a writer in the *Detroit (Mich.) Farmer*, declares that as the radio telephone gradually assumes its place "in the world of activities we will come to be more and more dependent upon it."

He writes in part:

> In 1897, just twenty-five years ago, Marconi made the remark in reply to a query that if sufficient power were obtainable and a large enough antenna erected it might be possible to transmit messages a distance of twenty miles through the air. Today there are boys in the United States, some of them as young as twelve and fourteen years who think very little of carrying on a wireless communication with their friends four and five hundred miles away.
>
> When the radio telephone, and especially the telephone broadcasting stations first came into use there were only a few amateurs and the operators of the so-called commercial stations to listen to the music and lectures that were thrown out into the air. From the very first the concerts and programs have been of the highest order and well worth listening to and the added interest of knowing that they have come hundreds of miles through space made them all the more entertaining. Today there are nearly one hundred high powered radio telephone broadcasting stations which serve the public, wherever they may be, with music, lectures, weather forecasts, news of the world, base ball scores, church services, etc., and what was in the beginning merely an experiment or an interesting form of amusement is fast becoming almost a necessity. Some say it is merely a fad that has taken the country by storm which will die out in time, but this is not true. It was bound to come as soon as the radio telephone reached the proper state of perfection and now that it has come it is here to stay. As it gradually assumes its place in the world of activities we will come to be more and more dependent upon it. It may be a good many years before the radio telephone is used to any great extent for inter-communication in the manner of the wire telephone of today but it will be of increasing importance as a means of communicating news, entertainments, business affairs, etc., from central broadcasting stations.

Launching into a descriptive opinion as to what the future of radio holds, the *Ashtabula (O.) Beacon*, paints a picture of the various uses to which radio will be put.

Editorially it says:

> It would require a most active imagination to see what the radio will do in the future. The infant colossus has already bridged continents and seas and threatens to become a part of the existence of every American family that can afford a cheap and simple receiving mechanism.
>
> With the manufacture of tiny receiving sets no larger than watches and purses the possibilities of the contrivance stagger the serious mind and provide a glorious field of fancy for the imagination. It has already been suggested that the henpecked husband and the small boy will lose the small privacy absence from the domestic hearth now affords. Equipped with an ear-piece they will be constantly under orders from the family's directing genius at home.
>
> Managers will develop baseball into a sort of outdoor chess by keeping in constant liaison from the bench with men on the field, and the rule that bars coaches from the gridiron cannot hinder directions by phone. Mothers visiting of an evening may croon a lullaby to a still yowling babe at home, and taxi drivers be entertained by conversations from the tonneau in the darkness of night.
>
> The possibilities of radio leaves most of us in such a state that we dare not contradict even the wildest predictions made and we expect to read every day of something more surprising than anything yet made public, of what wireless can do.

Assuming the popular attitude that people now have "developed" to the point wherein they take an active interest in what is being broadcast, the *Berkeley (Cal.) Gazette*, prints an editorial telling "What Radio is Good For." It gives as its opinion the following:

> ONLY SENDERS LIMITED
>
> With everybody going in for the radio telephone fad, it is well for the public to get clearly in mind just what the radio is good for. Secretary Hoover has pointed out its limitations along with its advantages. The wireless phone, he explains, will never be used generally for purposes of communication between individuals, as the ordinary telephone is. Such use would be impossible without individual wave-lengths in every case, corresponding to individual wires, and there are not enough different wave-lengths to go around. It is necessary to divide the wave-lengths among large groups and interests, if everybody is to be taken care of, and that bars promiscuous conversation.
>
> Aside from government use, however, there is left a definite and broad field for wireless use. It involves "the spread of certain predetermined material of public interest from central stations." This will be limited to news, education, entertainment and commercial purposes and other matters that may happen to be important to large groups at the same time.
>
> Senders, therefore, must be limited. But receivers may be unlimited. The "broadcasting" will be done from certain licensed and controlled centers, and anybody who wants to, may buy a receiver and "listen in" to whatever interests him.

"THE radio audience is no different than the concert, opera or vaudeville audience. It is composed of the same people and whatever pleases them out of their homes will please them in their homes"

Carolyn Beebe

Carolyn Beebe

Founder of the New York Chamber Music Society Tells Paul S. Gautier of Her Faith in Radio

THE fame of the New York Chamber Music Society had spread rapidly throughout the country within the past year so that when it was announced that Carolyn Beebe, founder of the Society and herself a noted pianiste, would play over the radio telephone, the radio public listened unusually attentively. Following the performance of Miss Beebe at WJZ hundreds of letters of appreciation of her work were written.

It has not been long since chamber music, including even the string quartet and the trio, was the most neglected of the tonal arts in the United States. As the pioneer of chamber ensemble, Miss Beebe has done much to completely draw away the veil of prejudice which formerly surrounded this branch of music.

Of the radio performance itself of Miss Beebe and the resultant pleasure which it gave, little need be said here; the satisfaction it produced, as those who listened in know, was the same satisfaction that always comes from hearing a true artist.

But it is of interest to note here the comments and the opinions of Miss Beebe about the radio telephone. Miss Beebe believes that the radio telephone is an accurate transcriber of music; in other words the tone transmission is perfect.

"For that reason," she told me, "I believe that radio will become valuable to art."

And when a statement of this kind comes from a woman who loves art as much as Miss Beebe and who knows music as well as she does, it embodies as high a recommendation of the value of the radiophone to society as could possibly be made.

AN ADJUNCT TO MUSIC

No true artist ever has or ever will place anything else on a par with or above his or her art. So that in her few words I was made to understand that the head and founder of an important society recognized in the radio telephone a permanent and useful adjunct to music.

"Friends of mine who listened in on one of the nights when I played told me that even the faintest trill was audible," she said. "One friend living about forty miles out of New York did not know that I was to play on the evening that I did.

"She knows my work very well and despite the fact that she had not seen the announcement of my name on the program she recognized my playing immediately and confirmed it by looking at the daily paper. This illustrates to me how truly the artist's efforts are produced over the radiophone.

"This holds true of course alike for both the singer and the player of an instrument. Radiophone broadcasting will fit in especially well, I believe, with the work of the New York Chamber Music Society, which regards itself as an educational force. Possibly I should explain just what the New York Chamber Music Society is. It consists of eleven solo artists who give solo and ensemble programs. The ensemble members include all combinations of piano, string and wind instruments, in duo, trio and quartette arrangements, up to and including eleven instruments. The organization has a record of giving over three hundred concerts in three seasons and everywhere the critics have pronounced the work of the society as the height of musical art.

"All the musicians of the ensemble are members of the New York Philharmonic Society and include Scipione Guidi, first violinist, and Gustave Langenus, claronetist, both of whom have broadcast over the radiophone; and Arthur Lichstein, Nicholas Kouloukis, flutist; Joseph Kovarik, violinist; Bruno Labate, oboe; Cornelius Van Vliet, violon-cellist; Anselm Fortier, double bass; Maurice Van Praag, horn; and Benjamin Kohon, basoon.

"When I conceived the idea of starting an American ensemble organization," Miss Beebe continued, "there were many persons who warned me that the repertoire would be above the people's heads. In some instances no doubt that was so, but the popular enthusiasm over our works has proved that America's musical taste is far higher than is commonly supposed.

"I had always loved ensemble work and I feel that one must be proficient as a solo artist to succeed in that field. To keep the unity of the ensemble one must have artists of unusual rank and so with the collaboration of the artists named I organized the Chamber Music Society. To my delight I found that the public, instead of disliking the programs, took just the opposite attitude. Invariably the appreciation of the audience was the greater, the better were the works which we offered.

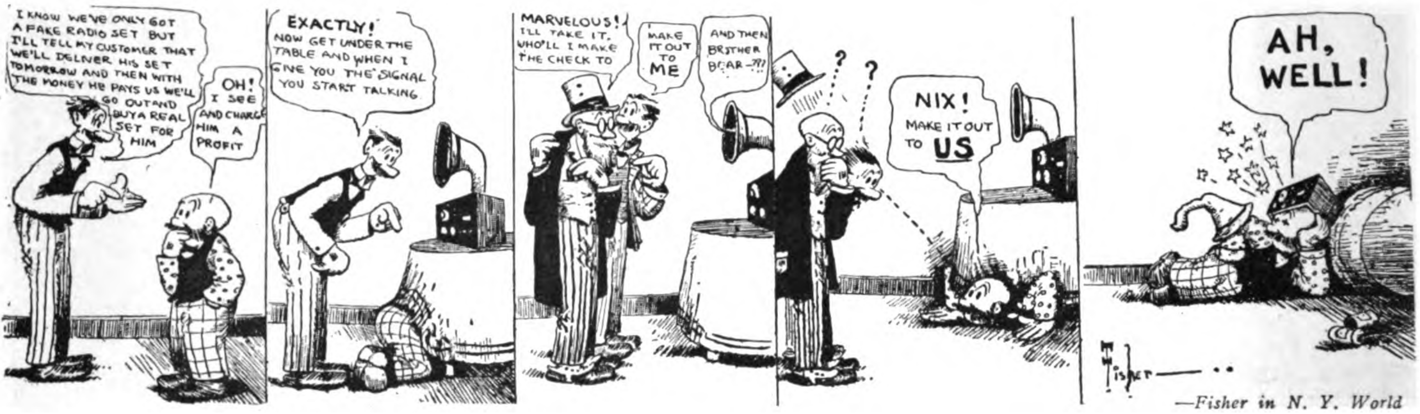
"I believe that the small ensemble is a more acceptable form of music to the average listener than the conservative string quartet or trio. The combination of wind and strings is more colorful. Our work consists largely, in a sense, of ear training, that is, of accustoming the listener to hear the clear colors and the various timbres of instruments of the small ensemble.

"I maintain that the radio telephone will win public appreciation possibly a little more quickly than it would otherwise, if, in the broadcasting programs, the theory around which our organization is built is put into practice. The radio audience is no different than the concert, opera or vaudeville audience. It is composed of the same people and whatever pleases them outside their homes, will please them within their homes.

"Chamber music will eventually find its place in the future with the radio public. I want to emphasize very strongly for those who control radio broadcasting that they should not overlook this point when the work of building up future programs commences."

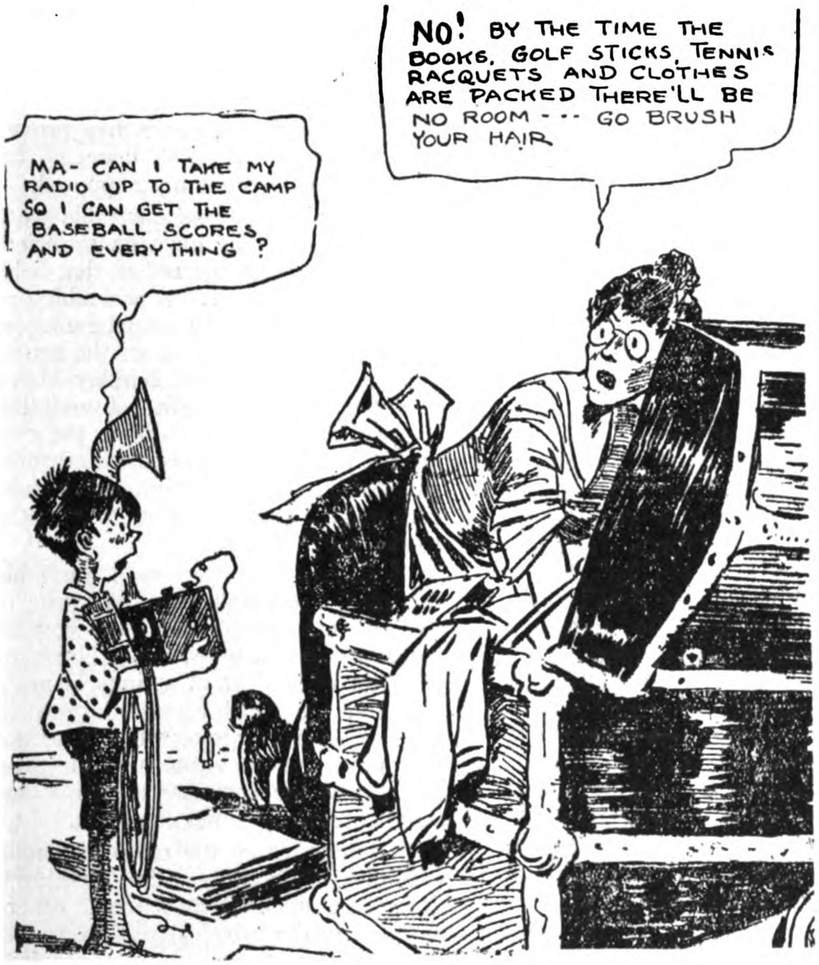
The Nimble Wit of New York City Cartoonists

YOU CAN'T BLAME JEFF FOR WANTING SECURITY


I KNOW WE'VE ONLY GOT A FAKE RADIO SET BUT I'LL TELL MY CUSTOMER THAT WE'LL DELIVER HIS SET TOMORROW AND THEN WITH THE MONEY HE PAYS US WE'LL GO OUT AND BUY A REAL SET FOR HIM
OH! I SEE AND CHARGE HIM A PROFIT
EXACTLY! NOW GET UNDER THE TABLE AND WHEN I GIVE YOU THE SIGNAL YOU START TALKING
MARVELOUS! I'LL TAKE IT. WHO'LL I MAKE THE CHECK TO
MAKE IT OUT TO ME
AND THEN BROTHER BEAR—?!!
? ?
NIX! MAKE IT OUT TO US
AH, WELL!
FISHER

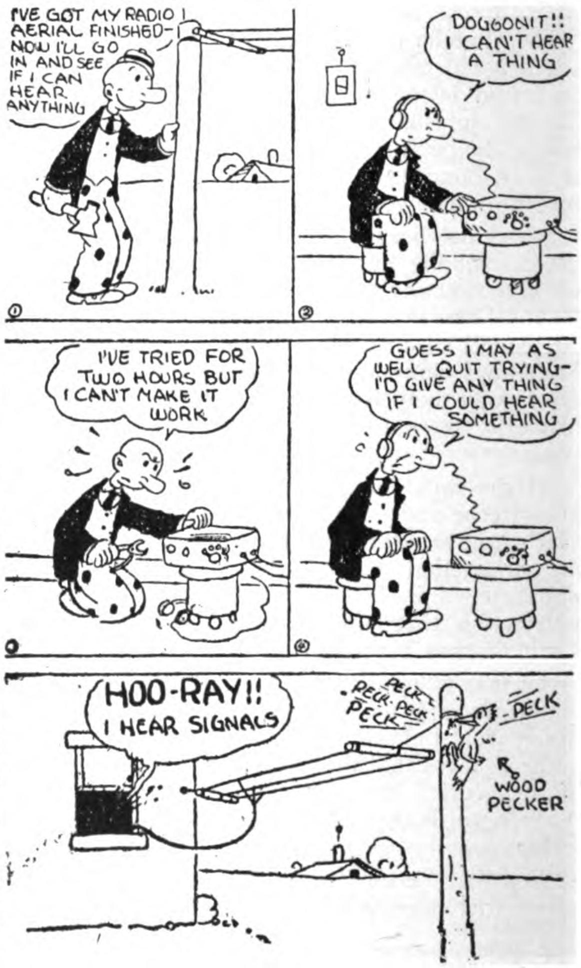
—*Fisher in N. Y. World*

WHEN A FELLER NEEDS A FRIEND


MA- CAN I TAKE MY RADIO UP TO THE CAMP SO I CAN GET THE BASEBALL SCORES AND EVERYTHING ?
NO! BY THE TIME THE BOOKS, GOLF STICKS, TENNIS RACQUETS AND CLOTHES ARE PACKED THERE'LL BE NO ROOM --- GO BRUSH YOUR HAIR

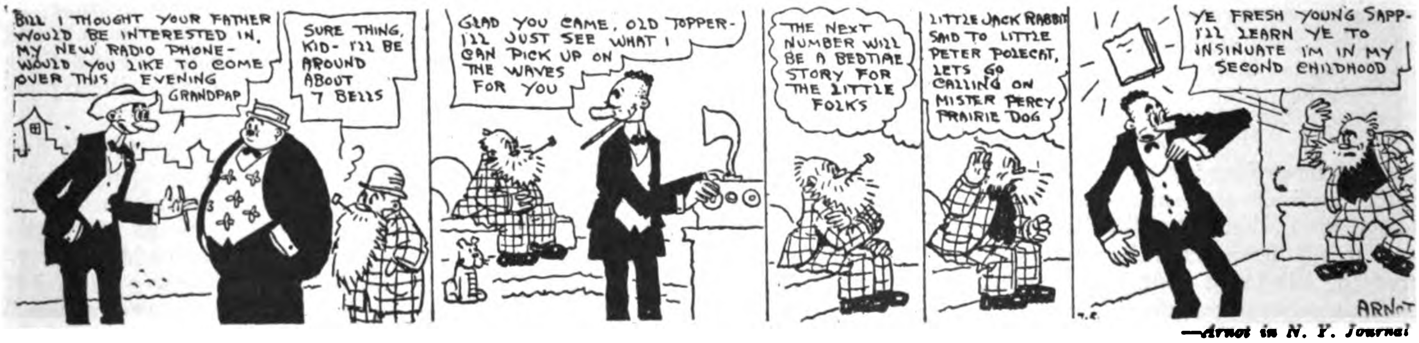
—*Briggs in N. Y. Tribune*

SOMEBODY ON THE WIRE


I'VE GOT MY RADIO AERIAL FINISHED— NOW I'LL GO IN AND SEE IF I CAN HEAR ANYTHING
DOGGONIT!! I CAN'T HEAR A THING
I'VE TRIED FOR TWO HOURS BUT I CAN'T MAKE IT WORK
GUESS I MAY AS WELL QUIT TRYING— I'D GIVE ANY THING IF I COULD HEAR SOMETHING
HOO-RAY!! I HEAR SIGNALS
PECK PECK PECK PECK
PECK
WOOD PECKER

—*Segar in N. Y. Journal*

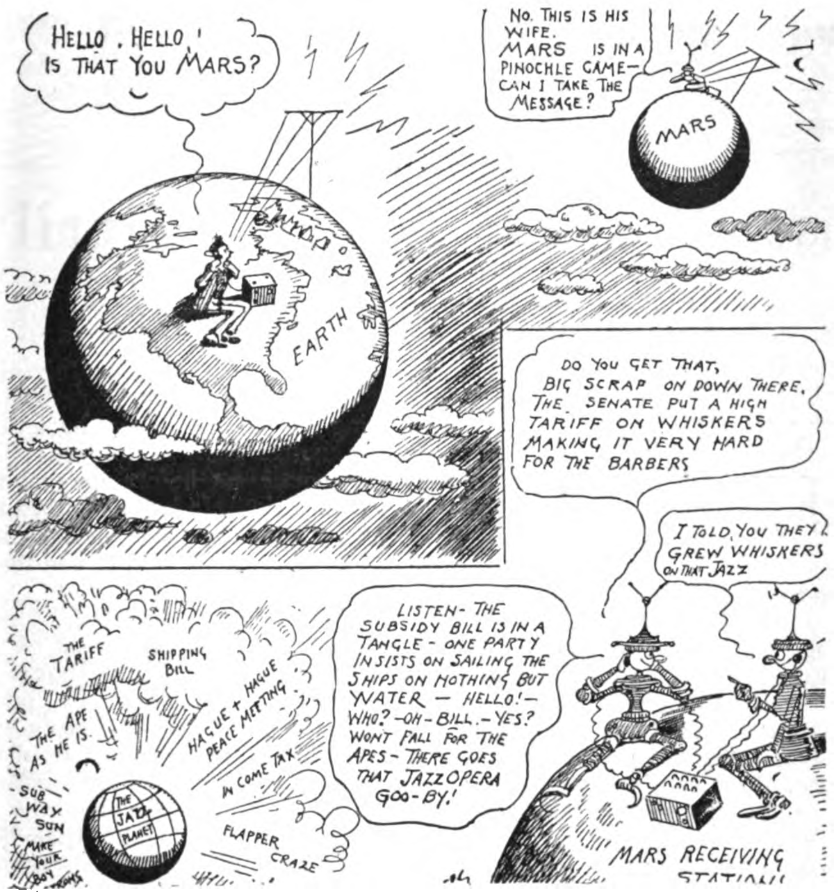
HOW DO THEY DO IT?


BILL I THOUGHT YOUR FATHER WOULD BE INTERESTED IN, MY NEW RADIO PHONE- WOULD YOU LIKE TO COME OVER THIS EVENING GRANDPAP
SURE THING, KID- I'LL BE AROUND ABOUT 7 BELLS
GLAD YOU CAME, OLD TOPPER- I'LL JUST SEE WHAT I CAN PICK UP ON THE WAVES FOR YOU
THE NEXT NUMBER WILL BE A BEDTIME STORY FOR THE LITTLE FOLKS
LITTLE JACK RABBIT SAID TO LITTLE PETER POLECAT, LETS GO CALLING ON MISTER PERCY PRAIRIE DOG
YE FRESH YOUNG SAPP- I'LL LEARN YE TO INSINUATE I'M IN MY SECOND CHILDHOOD
ARNOT

—*Arnot in N. Y. Journal*

Is Ever Concentrated for a Barrage on Radio

GOSSIPING WITH MARS


HELLO. HELLO! IS THAT YOU MARS?
NO. THIS IS HIS WIFE. MARS IS IN A PINOCHLE GAME—CAN I TAKE THE MESSAGE?
MARS
EARTH
DO YOU GET THAT, BIG SCRAP ON DOWN THERE. THE SENATE PUT A HIGH TARIFF ON WHISKERS MAKING IT VERY HARD FOR THE BARBERS
I TOLD YOU THEY GREW WHISKERS ON THAT JAZZ
THE TARIFF
SHIPPING BILL
THE APE AS HE IS.
HAGUE + HAGUE PEACE MEETING
IN COME TAX
SUBWAY SUN
MAKE YOUR BOY
FLAPPER CRAZE
THE JAZZ PLANET
LISTEN—THE SUBSIDY BILL IS IN A TANGLE—ONE PARTY INSISTS ON SAILING THE SHIPS ON NOTHING BUT WATER—HELLO!—WHO?—OH—BILL.—YES? WONT FALL FOR THE APES—THERE GOES THAT JAZZ OPERA GOO-BY!
MARS RECEIVING STATION

—*T. B. Powers in N. Y. Journal*

JUST LIKE A MAN

ONT YOU GET OF THOSE ADIO OUTFITS, DEAR? THEY MUST BE TERRIBLY INTERESTING
BAH! I HEAR ENOUGH TALK WITHOUT A RADIO
NOPE, I NEVER GO OUT ANYMORE, I GET CONCERTS N' EVERYTHING BY RADIO
RIGHT THROUGH THE AIR, EH? MUS' BE INTERESTING
HEY WINIFRED, LOOK WHAT I'VE GOT!
BAT
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6-2c

—*Knott in N. Y. American*

RURAL RADIO

SINCE HY PLUNKETT INSTALLED A RADIO IN THAT OLD HOLLOW TREE HE HASN'T MISSED A SINGLE WATERMELON.
RASTUS, YOU OL' RASCAL! GET OUT O' MY MELON PATCH! NOW YOU GIT. WHILE THE GITTIN'S GOOD!
LAWS' O' MASSY! SPOOKS!!

—*Kessler in N. Y. Globe*

Witching Wireless Waves Whirl Wittily

Our Own Broadcasting Station

This station broadcasts programs for all those troubled with insomnia. It transmits on a wave length varying from 1 to many more than 1 meter. The radio audience should not request information as to the exact wave length, for that would take the romance away. Letters of appreciation of our program should be addressed to the butcher (enclosing the unpaid bill) or to anyone else, except us.

SUNDAY

7 P. M. Señor Morris Coney, the motion picture producer, who specializes in short reels, will speak on "The Manufacture and Distribution of Films in One-Meter Wave Lengths."

8 P. M. A sermon by Dr. Gessitt, subject, "Why, And If Not Why, Why Not?"

The bedtime story will be given tomorrow night, weather permitting. 9 P. M. The Russian Folk Dancers—illustrating the latest Fox-Trotsky. The new Lean-In-Limp will be demonstrated. 10 P. M. "Berth Control," lecture by Dapper Dan, a well-known Pullman porter.

MONDAY

7 P. M. Mme. Iawanna Ukanavva, coloratura, will present a program of musical selections, among which will be that pathetic ballad: "Don't Apologize, Dear, I'm From Hoboken, Too."

8 P. M. Watermelon eating contest. Winner to take the seeds. 9 P. M. Address by Joe Doaks on "How Old Is a Turtle, and Why?" with impersonations by Mr. Doaks, illustrating the various steps in the growth of turtles.

TUESDAY

7 P. M. Fight returns direct from fireside. This is a remarkable demonstration, being the first time a description has come direct from the scene of a domestic battle. Names of the contestants will be broadcast at 6:59 P. M. Mrs. Tom Jenkins and Mr. being the likely contenders, with preliminaries by Harry Thompson and his strife. Realistic, blow by blow, including a description, throwing of a piano at the respective husbands, every note of which will be audible. 8 P. M. Intermission to talk it over and repair all instruments broken by the battle.

9 P. M. Returns from the New York Stock Exchange, including sharp reports, as bucketeering brokerage houses go to smash.

10 P. M. Debate by radio: "Resolved: A Radio Wave Is a Permanent One." Negative side by the Association of Beauty Parlors. Affirmative by Yewand Eye.

ANY DAY

Noon to midnight. Interference Ike Sparkoil will broadcast his familiar old song, "How Happy I Could Be With Ether Were 'Tother Dear Stations Asleep." Between verses Ike will demonstrate his ability as an operator by sending the following message at a speed of three words a minute:

QST QST de IKE QRM QRT
yours, IKE.

As an added attraction, this message will be sent simultaneously in all wave lengths. No extra charge for this feature.

Midnight to noon. Interference Ike Sparkoil will repeat his program.

High Frequency.

It is generally conceded that Dr. Charles P. Steinmetz, nominated for N. Y. State Engineer, ought to poll a good many volts.—F. P. A. in *The N. Y. World.*

THE BASEBALL GAME

STRIKE TUH!
YA CAN'T TELL ME THAT FOOL CONTRAPTION IS GIVIN' TH BASEBALL RETURNS'

—*Pittsburgh (Pa.) Times*

Our Radio Fourth

(With Apologies to Collier's.")

"Well, sir, the Fourth of July ain't what it used to be," said Uncle Henry, hanging his headset on a hook and taking another chaw of tobacco. The Cub Reporter sat before him on the edge of a chair. He had just asked the famous patriot's views on the contribution of radio to the Safe and Sane Fourth.

"Time was," continued Uncle Henry, "when only the bravest of the brave could go through a Fourth of July celebration unburnt by punk, squibs and powder in its many gay forms. The Fourth claimed its thousands of killed and wounded. Most of us came through the day with at least one major burn, and a whole battalion of captain, lieutenant, sergeant, corporal and private burns, wounds, punctures an' lacerations. To say nothing of the rattle in our ears from the explodin' giant crackers and the rumble of the oratory that crackled all over the village green.

"Them was the good old days," Uncle Henry sighed. "Only the fittest lived to see the sun go down.

"Just look at us now," he complained, "it's so tame that they's nothin' to do but hang out a flag and sit in the breeziest winder listenin' to a speech and a lot o' music by radio."

"Land sakes," interrupted Aunt Mariah, who was knitting industriously by the other window. She wore a single receiver headpiece, preferring to keep one ear open for gossip.

"Land sakes, Henry, how you go on. Many's the Fourth of July I've sat up all night nussin' you, and the arnica and witch hazel and bandages I put on you an' all the neighbors, would start a hospital, so it would. It's a good thing, so it is, that we can celebrate by this here rady-phone and spend the day in peace and quiet. Why, I remember one Fourth when . . . . listen, Henry, ain't that just grand?"

But Uncle Henry didn't hear her. He had put his headset on his ears and was listening happily, rocking back and forth gently.

When Whimsical Wisdom Winks

The Radio Lover to His Love

By S. E. Kiser

Dear, are you sure your rheostat
  And amplifiers are just right?
Your variometer—how's that,
  And are your variocouplers tight?
I'm doing all I can, my sweet,
  To make myself distinct and clear;
I love you only, I repeat—
  Don't mind that; it was static, dear.

I'm glad you get me better now;
  Your lattice was at fault, no doubt;
I wish I dared to tell you how
  You've caused my fears to flicker out.
Your amperage is mighty high,
  At least to me it seems to be;
Please, dearest, won't you tell me why
  You broadcast so reluctantly?

I'll tell the world, and gladly, too,
  That you're my precious binding-post;
Of all the tuning signals, you
  Affect my filament the most!
You have me coiled; my batteries
  Are at your service for all time;
Restrict my wave-lengths as you please,
  I'll still consider you sublime.

If as your grid condenser I
  May serve, I'll gladly do my part,
And if your honeycomb tunes high,
  I'll get you, anyhow, sweetheart.
Please let our hook-up follow soon,
  Our dials set for ecstasy,
And we will gladly keep in tune,
  From atmospheric troubles free.

—*N. Y. American.*

Make It Safe for Husbands

To the Radio Editor of The Post:

An experience I had the other day suggests to me an improvement in radio that must be made before radio can be truly useful to all families.

My wife called me up at my radio station, VG, and asked me to bring home a loaf of bread. This occurred in the busiest hour of the day. Had she called me up on the regular telephone I would have upbraided her severely for her thoughtlessness in calling me up at the wrong time.

But over radio I could not speak to her in that way, because all the neighbors who have radio sets would have heard it.

Therefore, I had to swallow my anger, as the saying is.

Thus, you see, radio interferes with the normal family life. It should be made safe for cussing, so that a man can tell his wife what he thinks of her without everybody in town hearing him. I hope something can be done about it.

Yours truly,
VILLAGE GOSSIP.

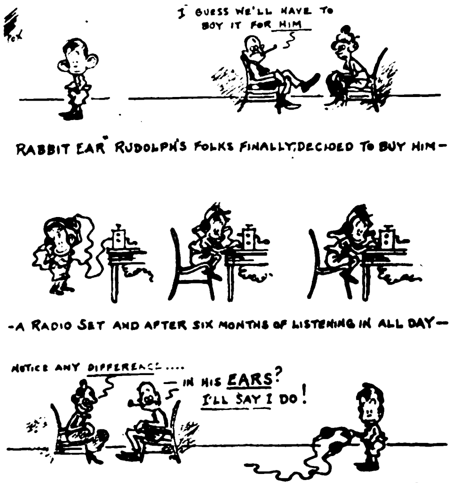
Al Segal in the *Cincinnati Post*

Maybe Assistant Secretary Roosevelt was afraid the lady politicians would not ring off if he let them use the navy's wireless.—*Indianapolis Star.*

"Through it all," the Times says of the Philadelphia girl who listened to the radiophone while undergoing an operation, "the patient entertained the nurses with laughing comment on the 'good execution' of the artist who was transmitting Chopin for her." What do you suppose some of her laughing comment was? Probably she said, "Chopin, eh? Ought to be Choppin'."

—*N. Y. World.*

WONDERS OF RADIO


I GUESS WE'LL HAVE TO BUY IT FOR HIM
RABBIT EAR RUDOLPH'S FOLKS FINALLY DECIDED TO BUY HIM—
—A RADIO SET AND AFTER SIX MONTHS OF LISTENING IN ALL DAY—
NOTICE ANY DIFFERENCE....
—IN HIS EARS?
I'LL SAY I DO!
RABBIT EAR'S FOLKS ARE MIGHTY GLAD THEY BOUGHT IT!

—*N. Y. Globe*

Wise Crack-les

L. C. G. writes in to ask if Lightning Bugs cause static. He says his friend Ed advised him to close down his station during the Summer, because the heavy crop of these bugs on Long Island would cause unfavorable atmospheric conditions.

Ed is wrong. Lightning bugs don't cause static; they cause earthquakes.

* * *

Contributes Frank L. Velten, of Brooklyn: A very sophisticated, bobbed-hair young lady was talking to two wise young men on a trolley last night. The conversation drifted to radio and weather.

"Oh, yes, of course," said the y. l., "all the thunder storms we have had this month are directly due to radio broadcasting."

"You betcha," chimed in the y. m. "and lightning too."

Questions and Answers

Dear Editor:

When are we radio fans going to hear a lecture by Henry Shallow? I think he would be very interesting on the subject of "Mussels and How to Make Currents Out of Them," or, "Is Politics a Shell Game?" Another subject might be, "How Vibration Improves the Health of Tourists." Please persuade Henry to give these lectures.

HOPEFUL.

Answer: Confidential radio advices inform us that Henry Shallow is now engaged in making his first real automobile. Until that long and hazardous task is completed he will not be available for the broadcasting studio.

* * *

Dear Editor:

I hear that Lee Jay D. Woody has written a lecture entitled "Pipe Lines to Profits, or Why My Bank Account is Tubular." When will we hear this?

ANXIOUS.

Answer: This lecture has been submitted to the censor. He still has it.

WORLD WIDE WIRELESS

New 1 K.W. Phone Transmitter Heard Across 2,100 Miles

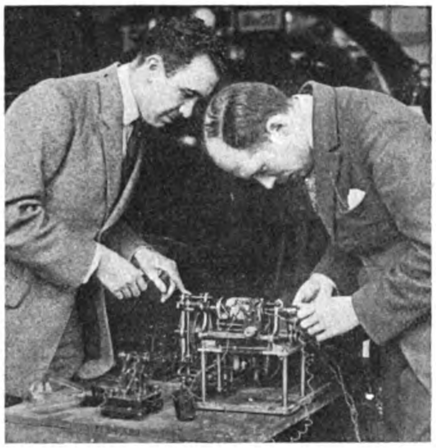
STRIKING results in radio telephone transmission were secured June 26, when the new 1,000-watt phone transmitter designed by the Radio Corporation of America and installed on the S. S. *H. F. Alexander,* was heard perfectly in San Francisco while the ship was moored to a dock in Honolulu, 2,100 miles away. The transmitter is the new instrument designed especially for ship use, which was described in THE WIRELESS AGE of last June. Its first long-distance voice performance more than justified the predictions of the Radio Corporation's engineers and other experts that the new set would do startling work. The fact that the record was made during the Summer and over a stretch of ocean that is particularly pestered with static disturbances make the performance all the more remarkable.

The phone transmitting test was preceded by considerable code traffic between the steamer and station KPH of the Radio Corporation at San Francisco. When the traffic had been cleared a phone test was suggested, as the code had been coming across with exceptional clarity. Neither station thought that it would be possibly to secure perfect results, and only hoped to hear an occasional word. However, the first "Hello" of John J. Slater, the steamer's operator, was heard in San Francisco. After he had said "If by any chance you are picking me up, confirm by key, then come back with voice," San Francisco reported by code that voice reception had been perfect. Code then was abandoned and voice communication used. Weather reports were exchanged, and finally the operator at the Golden Gate connected his receiver to a land wire running to the San Francisco office of the Radio Corporation, where the voice from Honolulu was heard over the ordinary desk telephone.

The officers of the Radio Corporation are highly elated over the new record. It promises much for the immediate future, when, as more and more steamships are equipped with this apparatus, ship to shore and ship to ship telephone conversations will take place over long distances, and eventually become as commonplace as the land telephone now is. All passenger liners will be so equipped as soon as the demand on the part of the traveling public makes this advisable. With the new equipment it is possible for passengers on liners to talk directly with their offices and homes on shore, ending the separation from business and the family circle formerly entailed by a sea voyage.

Exceptional Distance Work on the Pacific

SOME exceptional distance work was done by commercial spark transmitters on the Pacific during June. On the 15th the San Francisco, Calif., station of the Radio Corporation, KPH, worked with the S. S. *Tahiti,* enroute from Sydney to San Francisco, while the ship was still 19 days out, a distance slightly over 5,000 miles.



Gaston Tohanneau and Marcel Touly, French engineers, work on a device for transmitting pictures by wireless, which tests show soon may be commonplace

On June 23, KPH copied eight messages from the *Tahiti,* while the vessel was 3,295 miles out. The ship's operator reported that the signals of KPH were frequently heard while the vessel was at Sidney Harbor, N. S. W., Australia.

The transmitter at KPH is a 5 K. W. non-synchronous rotary spark set, and the transmitter on the *Tahiti* is a 2 K. W. non-synchronous rotary spark set.

Anatolia Uses Radio

ANATOLIA now is in communication with the rest of the world by wireless. A new station has been opened at Kaisariye, which sent its first message to Moscow. The Angora government is to open another station at Mersina for communication with European capitals.

Unveil Roll of Honor to Marconi Operators

WHEN, on June 21, a Roll of Honor was unveiled in Marconi House, London, in honor of the Marconi operators who fell in the war, the ceremonies were broadcast by wireless telephone. Wireless operators on ships in British waters stood by at noon to give the broadcast ceremony the right of way. The bugle calls of the Last Post and Reveille were sounded by six bugle boys from the training ship *Exmouth.* Mr. Godfrey Isaacs, managing director of Marconi's Wireless Telegraph Company, delivered an address prior to unveiling the roll, which contains 348 names, of which 316 are ship operators who were drowned when their ships were sunk by enemy submarines.

Mr. Isaacs said in part:

"We are proud of these great deeds performed as they were by young Marconi men acting upon their own initiative in the face of death, and we are certain that no records of the war show deeds which reflect greater credit upon the nation or any individual organization.

"It is gratifying to note that among the surviving members of the office and sea-going staffs are several recipients of honors, decorations and awards. These also bear witness to work well done in the cause of civilization and humanity.

"In exposing to your view the names of your late colleagues I feel sure that this memorial will be an incentive to each one of us to follow the high standard of national and personal duty, which was established by those whose memory we here perpetuate."

Gerard Swope Heads General Electric

GERARD SWOPE has been elected president of the General Electric Co., Schenectady, N. Y., succeeding E. W. Rice, Jr., who thus realized his wish to devote his time to engineering and research. Mr. Rice has been made honorary chairmen of the board of directors. As in the past he has been responsible for many important developments in the electrical art, it is expected that with his new leisure he will be able to bring still more important plans to fruition. Mr. Swope, the new president, is president of the International General Electric Co.

Radio Beacons Being Developed for Airplane Use

USE of radio direction signals for the guidance of airplanes is being developed both in the United States and abroad. In the United States, the Air Mail Service, which recently received an appropriation of $1,900,000 for extending its routes, is co-operating with the Signal Corps, and radio beacon stations are to be established along all mail airplane routes. Landing fields are to be provided with a special transmitter, using an antenna in the form of a coil so designed that the signals radiate from it in their maximum intensity at an angle of 30 degrees from the ground. An airplane in flying over the transmitter would notice when the signals were at their greatest intensity, as it cut through the cone formed by the waves emitted at the 30-degree angle. By flying back and forth several times it would be easy to locate the exact position of the field, even in fog and storm, and descend safely.

In Europe, where passenger-carrying planes operate on schedules as regularly as railroad trains, the radio beacon is being used, especially for cross-Channel work, enabling pilots to take the most direct line of flight.

New Lake Steamer Installation

THE Radio Corporation of America has just installed a new radio telegraph and telephone transmitter on the *City of Detroit III,* which sails on the Great Lakes between Buffalo and Detroit. This is the latest installation purchased by the Detroit & Cleveland Navigation Co., which was a pioneer in equipping Great Lakes steamers with radio apparatus, having first experimented with it in 1902.

Goniometer Proves Value

A NEW and striking demonstration of the value of radio goniometric stations in New York harbor was given recently, when the *Oropesa* of the Royal Mail Steam Packet Line was guided safely up the channel in a dense fog. For three days previous to reaching the coast the ship had steamed under reduced speed on account of the fog. When it got within range of the U. S. Navy radio compass stations at Amagansett, Fire Island, Sandy Hook and Mantoloking, the captain asked for a position report, from which a course was laid for the Fire Island lightship, so accurately that two hours later the vessel passed within sixty yards of the lightship. The course was then changed for Sandy Hook, and the ship soon docked safely. Captain Le Brecht said on docking that he would have been many hours late if it had not been for wireless assistance, and that he believes that in time a wireless course across the ocean will make navigation safe, free from danger of steamers straying out of the east and west bound tracks.

Fishermen Install Phone Sets

THE radio telephone is to be used extensively in directing the operations of the big fishing fleets sailing out of Gloucester, Mass., to the Grand Banks off Nova Scotia. Several of the fishing vessels have been equipped with receiving sets, and a powerful transmitting station is being erected in Gloucester, at the expense of a co-operative syndicate of ship owners. By using the radio telephone from shore to ship, the skippers on the Banks will be advised of market conditions, and the ship owners expect to profit largely by bringing their ships to port when prices are most favorable, instead of having them come in haphazard, as at present. In addition, the receiving sets on the ships will provide entertainment for the crews. The fishermen have been wishing to use wireless for years, but have been unable to do so, as operators could not be secured. Now that the radio telephone has made voice communication possible by wireless, the fishermen can have the advantages of radio, which they need so much.

Chicago riders on the "L" enjoy the radiophone music during tests with apparatus aboard the trains

German Traffic Growing

NEW records in radio service have been made by the Drahtlose Uebersee-Verkehr, A.G., or the Overseas Wireless Co., of Germany, operating stations at Nauen (POZ) and Eilvese (OUI). Traffic through these stations has been steadily increasing since they were opened for commercial messages. In August, 1919, the entire business for the month amounted to only 100,000 words, but on March 16 last 50,000 words were transmitted in a single day.

R.C.A. Makes Tubes Available for Ship Work

RESPONDING to the call of humanitarianism, the Radio Corporation of America has for the first time permitted the use of its vacuum tubes on competing ship stations. A new receiving tube has been designed especially for ship use, and will sell for $10. It will be a great improvement over the crystal detectors now in use, and will make sea travel safer, which was the reason that the Radio Corporation decided to allow their use on ships. Heretofore, the corporation's tubes have been limited to amateur and experimental use, and the sale of tubes to commercial stations competing with the Radio Corporation's own stations was refused.

The present exception in favor of ships was made in response to a humanitarian plea by the United States Shipping Board, which pointed out the fact that radio is a vital safeguard at sea and that each ship should possess the highest type of apparatus. The corporation, in responding to the plea, drew up a special contract for licensing ship stations under its controlling tube patents. Among other conditions the contract forbids the use of the tubes on shore. The new sea tube was designed especially for conditions on board ship, and resembles the Radiotron.

Use Radio Currents to Control Street Lights

USE of "carrier current," a current flowing at radio frequencies, for the control of city street lamps has been found to be practical, and no doubt in time the electric street lamps of American cities will be radio-controlled. Tests at Lynn, Mass., and Little Nahant, four miles away, made by radio experts of the General Electric Co., demonstrated recently how the Little Nahant lights can be controlled from the power house at Lynn, over the same wires that carry the lighting current.

The method used is a development of the radio industry. At the power house a high-frequency generator, using a vacuum tube, was used to generate radio-frequency waves, which were placed directly on the low-frequency feeder circuit running to Little Nahant. Relays there responded to the radio current, and operated switches that turned the lights on or off. By varying the frequencies and the tuning of the relays, it is possible to effect independent control of various parts of the same circuit. The cost of installation is small, as the equipment consists only of the radio transmitter at the power house, and a relay switch at each control point.

Army and Navy Share Arlington Station

THE temporary radio station of the Signal Corps, U. S. Army, at Washington Barracks, has been abandoned, and the Signal Corps now shares the big Arlington station with the Navy. The Army eventually will use two transmitting sets, one with 10-kilowatt power, and the other with twice that amount. The latter set, on 3,000 meters, will reach as far as Omaha, Neb. For the present the Signal Corps is using a 2 K. W. transmitter at Arlington, on its regular traffic on 2,650 meters, with control from radio headquarters in the Munitions Building. The Navy continues to operate two sets at Arlington, but will be able to lend the Army its 100 K. W. spark set when necessary, and also its arc set.

Clifden Replaces Poldhu

THE famous Marconi wireless station at Poldhu, Cornwall, Wales, has closed, and MBD, the call for which ship operators have listened eagerly for the last 19 years, no longer is heard. Traffic formerly sent throughMBD now goes through MFT, the Marconi station at Clifden, Ireland, which has taken up the famous Marconi commercial and press service. Poldhu made wireless history, having been the first high-power wireless station to be built, under Marconi's direction, and having sent the first message across the Atlantic, on December 12, 1901. The future of the historic station is uncertain; probably experimental work will be carried out there.

Swedes and Finns Want Ship to Shore Stations

BUSINESS men who travel back and forth over the Baltic Sea between Finland and Sweden soon will be able to keep in touch with both countries by means of the wireless telephone, plans for the service having been approved by the Swedish Telegraph Administration and the Abo (Finland) Chamber of Commerce. Consul Leslie A. Davis, at Helsingfors, Finland, has reported to the Consular Service that the Gesellchaft fur Drahtlose Telegraphie of Berlin proposed to install the necessary equipment. The Stockholm authorities quickly expressed a desire to secure the advantages of the system, and at Abo negotiations were opened with the Finnish Ministry of Trade and Industry for a concession. When the system is in operation it will be possible for telephone subscribers connected with the Swedish and Finnish telephone systems to call a radio telephone central and through it talk with passengers on steamers in the Baltic, or with residents of cities over their home or office telephone. At the same time that this radio development is under way, big plans for submarine telephone cables are being made to link all countries in the Baltic region.

British Police Study Radio

SCOTLAND Yard, England's secret service headquarters, is experimenting with wireless, both telephone and telegraph, as a means of apprehending criminals. Receiving apparatus has been installed at the Yard, and tests have been made in transmitting details of crimes and criminals. Strangely enough, but few of the 58 outlying county constabularies are connected with headquarters by wire telephone, and it is thought that wireless will relieve this situation. It is expected that a wireless police net will be spread over the country. Confidential reports will be coded and then sent by wireless telegraph, while descriptions of wanted criminals will be broadcast by voice to all who have receiving instruments. The details are still being arranged, but it is expected that radio will play a large part in the British police system.

Almost under the shadow of famous Notre Dame cathedral on the banks of the Seine, the Paris police experiment with a new radio-equipped motor truck

Denmark Reports Icebergs by Radio

AN iceberg reporting service has been established by radio in Denmark. Reports are broadcast whenever necessary by the coast station at Blaavand, at 12:20 and 10:20 p. m. These give the positions, size and estimated course of such icebergs as have been observed in Danish waters.

Nauen Radio Station Being Re-Designed

THE wireless telegraph station at Nauen, near Berlin, Germany, is being reconstructed and greatly enlarged in order to secure improved working conditions with the United States and South America. Additional capital amounting to 25,000,000 marks has been secured, and work has been started. The antenna system is to be considerably altered, seven new 210-meter (689-foot) masts being planned to take the place of four existing masts. Two sets of aerials are used, one for trans-Atlantic work, and the other for communication with European stations. Both these have been entirely distinct, and at right angles to each other, to prevent interference, but under the new plans it is expected to effect central control of the antenna circuits by means of switches that will enable the many strands of aerial wire to be grouped electrically to suit the varying needs of the traffic. The antenna is 2,484 meters long, or about a mile and a half. The present power plant, using high-frequency transformers of from 130 to 400 kilowatt power, is being re-designed, and also much work is being done in developing and improving high-speed sending and receiving mechanisms.

Chapultepec Station Reopened

RADIO communication between Mexico and Chile has been resumed, the powerful station at Chapultepec, Mexico, having been put in operation once more. The first messages exchanged were between President Obregon of Mexico and President Alessandri of Chile.

Coming Radio Shows

CLEVELAND, Ohio, is to have a radio and electrical show August 26th to September 4th, in the Cleveland Public Auditorium. More than 200 display booths have been arranged, and space has been taken by dealers, manufacturers and technical schools. Prizes will be given to school children for the best home-made receiving sets. Special exhibits will be made by the Army, Navy and the Boy and Girl Scouts.

APPLICATIONS and space diagrams for the coming electrical exhibition in Salt Lake City, October 2nd to 14th, already have been distributed by A. M. Jackson, manager of the Rocky Mountain Electrical Exposition, from his offices at the Kearns Building, Salt Lake City. The exposition will be exceedingly elaborate in decorations, including a large illuminated arch. The Rocky Mountain Electrical Co-operative League is fostering the event. Radio companies are expected to show many interesting displays.

Radio Communication in Russia

Pre-War Development, War-Time Uses and Future Requirements and Opportunities Described by the Former Chief of Russian Radio Communication

By Col. I. Mouromtzeff

THE name of Russia is as significantly connected with the birth of Radio Telegraphy as is the name of Italy, for Russia and Italy were its independent birthplaces. Indeed, Russia claims first place in point of time. A. S. Popoff, a Russian professor, having constructed a receiver for electromagnetic waves a year before Marconi announced his famous invention. Each worked without knowledge of the other's achievements. Popoff, however, had in view the use of his discovery as an indicator of atmospheric disturbances.

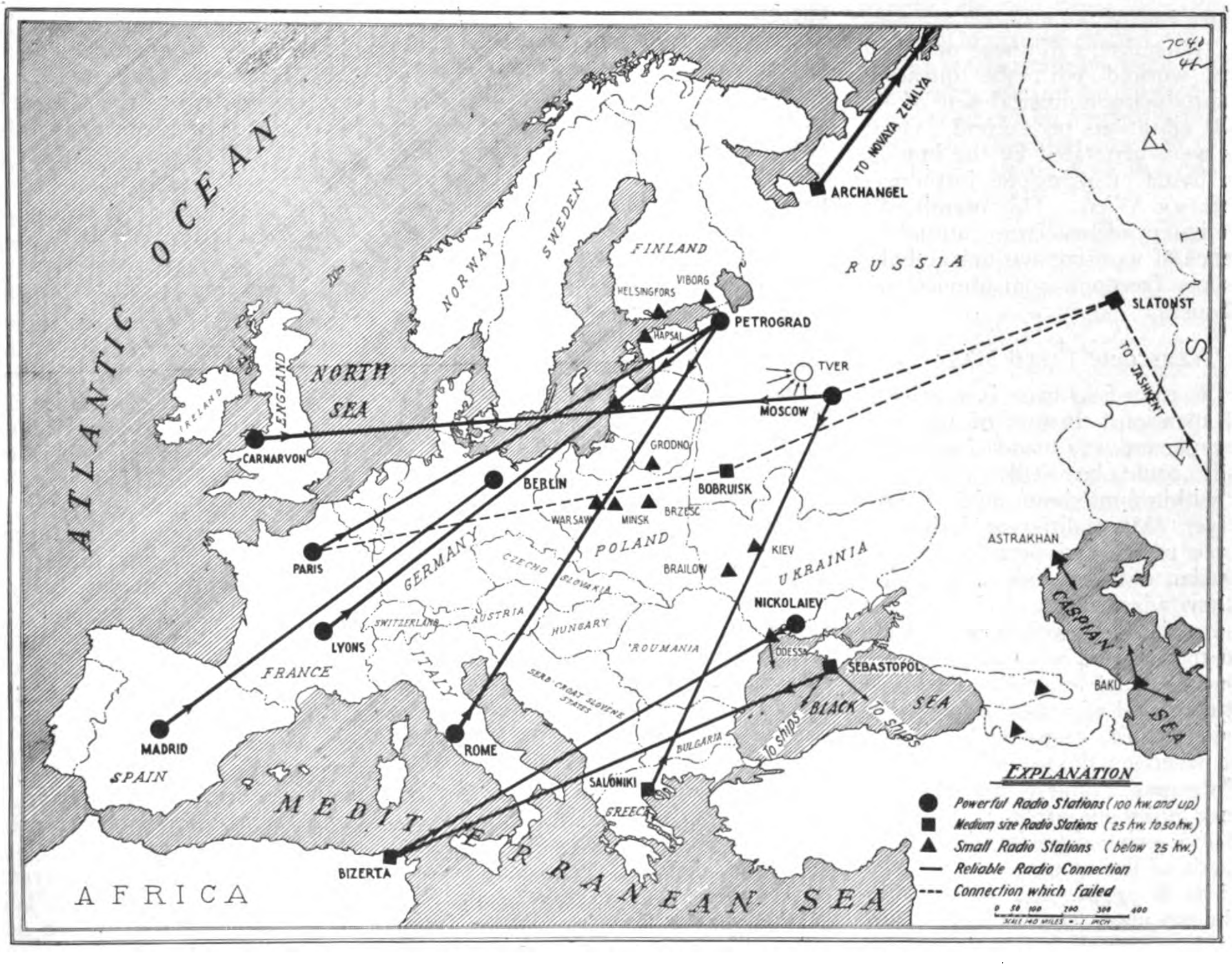
For a long time (until 1909-10) the Russian Government, staggering under the burden of an enormous budget for the upkeep of a vast army, was unwilling to spend money for development along technical lines. This was especially true of something that seemed of so little practical importance as radio telegraphy which then was looked upon as a modern toy and a very expensive one. The same attitude was observable in other countries, the general conception being that radio telegraphy could be of little service except on ships. Even in this case real faith in it was not expressed until 1909, when the sinking of the *Republic* proved its value.

Ship Installation

Thereafter, many Russian ships were provided with small radio sets. Among them were included all the different makes that were on the European market at that time: Popoff-Ducrete, Marconi, Arco-Slaby, and Telefunken. In all the huge Russian army, however, there were in 1909 only two radio companies. Each company had six radio field stations that had been delivered by the Marconi Wireless Co. during the Russian-Japanese War away back in 1905.

Aside from the mobile army equipment, Russia had only a few land stations, at St. Petersburg, Viborg, Kiev and several in the Far East, but their establishment and location were not in accord with any comprehensive plan. They were limited in range and were not of national importance.

The chief characteristic of the radio stations built prior to 1910 was the low frequency of the spark, or, as it was called in Russian, the "crackling" spark, generated by the Brown double-waved transmitter. The granular coherer, combined with the regular Morse recorder, was used as a receiver, but about the end of 1910 the telephone receiver was introduced, following the invention of Marconi's magnet detector, Schloemilch's electrolytic detector and then the contact, or crystal detector. Messages that were



Map of Europe showing war-time Russian radio telegraph stations and their relation to each other and the rest of the continent sent by "crackling" spark transmitters were greatly disturbed by atmospheric discharges, the latter being of course a great detriment to radio communication.

In 1910 the Russian Government, following the example of its future allies and enemies, began to give more attention to the development of radio telegraphy but almost entirely along military lines. First, a large number of field stations were provided for the army. Later on a system of permanent stations was planned for use within the country and measures also were taken to establish radio communication with France.

Much Experimenting Necessary

During the development of the Russian army field radio apparatus the stations were reconstructed many times in endeavoring to solve the very difficult problem presented by Russian distances. Each radio unit had to have a range of 250 versts (170 miles) yet it could not exceed a maximum weight of twelve poods (432 lbs.) for each of the three two-wheeled carriages used to carry the complete equipment of the field station. When its mobile stations finally were rendered throughly practical the Russian Army had the most perfect field-radio of that time, which could move easily on the bad roads of its future theatre of war.

The transmitters of these new field stations worked with the quenched spark, producing a musical note of 400 to 2,000 vibrations per second. Oscillations were generated by the impulse circuit, based on principles introduced by professor Wien. This permitted a certain independence from mutual interference of working stations and also gave some freedom from atmospheric disturbances.

Telescopic Field Mast

The Russian field mast is worthy of special mention. It was of the telescopic type, and was made of steel piping. It could be easily altered in height within a maximum of 25 meters or 75 feet. Many different designs of telescopic masts had been offered to the Russian radio specialists, and after tests they adopted the Fajance mast because of its light weight and its extension mechanism, which was on the outside and could be easily taken care of. It consisted of a worm drive with a handle, conic gears and a long-toothed wheel on the top of the lowest link of the mast. This wheel drove out the inner links one after the other by means of a series of perforations along the length of the mast.

At first it appeared as though the holes in the mast would make its use impossible. The slightest wind would whistle through the openings and the sound produced was as though a giant fife were wailing its grief. The howls could be heard for miles around and spread anguish and dejection among the peasants. This difficulty was soon overcome, however, by making the mast turnable within its bearings, so that the holes could be turned away from the wind, when even the strongest gale produced no sound.

Field stations were used in the Russian Army during the war on a big scale and many times the service they rendered was priceless. As one of many instances it may be mentioned that in the battle of November, 1914, when the entire Fifth Russian Army near Sodz was cut off from the other armies by General Mackenzen's troops, the only connection with Russian Headquarters for about four days was by means of radio. As a result of radio-arranged strategic moves, the Fifth Army escaped from its predicament and a German Army corps had narrow escape from capture.

Aids in Quelling Revolt

In 1916, the Kirguiz tribes (nomadic inhabitants of the steppes in Russian Middle Asia), revolted and spread destruction throughout a wide region. Telegraphic communication between several cities was completely cut off. A number of field radio stations were sent under military guard and successfully maintained communication for a month or so, while the revolt was suppressed.

The field stations were frequently used, also, for other than military purposes. For instance, the coast-guard service on the White, Baltic and Black Seas found them invaluable.

The most powerful fixed stations of the Russian Army were planned for Chita (Transbaikal), now seat of the Siberian Bolshevist government, and Tashkent (Turkestan). Each was of 100 kw. power. The comparatively small Caucasian stations played a prominent part in the manoeuvres of the Caucasian armies during the war, but the others were not ready before 1915 and even 1916, so that they played little or no part in the life of old Russia. However, the important result of the use of radio for military purposes was that the indifference toward radio telegraphy was overcome. Familiarity with it spread and many business people realized its usefulness for commercial purposes.

As a result, a number of stations were built in the far North, at Archangel, on the islands of Novaia Zemlia, and Vaigach. These gave reports of ice-movements in the Arctic Sea. Stations in the Far East, in the Kamtchatka and Anadyr peninsular regions (at Petropavlovsk, Ochotsk, Anadyr) assisted the daring explorers of that rich but distant and wild land.

In 1910 a station was erected at Bobruisk (near Minsk) exclusively for connection with the Eiffel Tower station in Paris, but the first attempts to communicate were not successful. This may be readily understood, because the total power of the Bobruisk installation was not above 40 kw., which was entirely insufficient to cover the distance of 2,000 kilometers or 1,200 miles between the two stations (vacuum tube transmitters, detectors and amplifiers did not yet exist). Besides, there were many mistakes in the design and construction of the station. In 1914 it was decided to abandon the old structure completely and to build a new 150 kw. station in the same location. This was never done, however, as the outbreak of the war brought about the settlement of the problem of foreign communication in a different way.

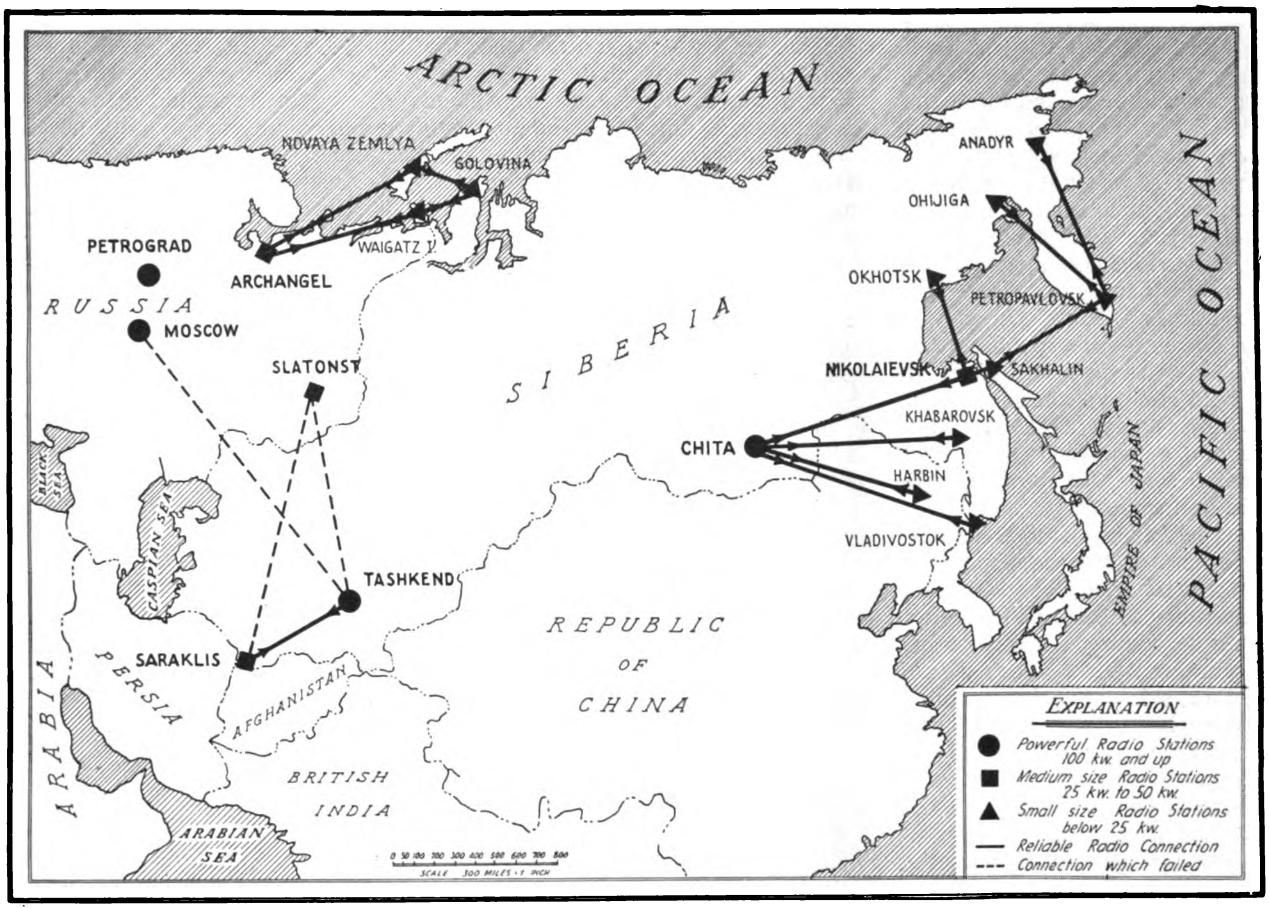
Another powerful station for communication with foreign countries was planned for Nicholaieff on the Black Sea. It had 100 kw. power, but it was not put into operation until several months after the beginning of the war, and in the end it served only for the local needs of the army in the Ukraine, being too far removed from the center of activity.

All these stations were delivered either by the Russian Society of Wireless Telegraph (after 1912, under financial control of the Marconi Wireless Co.), or by Siemens & Halske.

Stations at Tsarskoe Selo and Moscow

The great World War broke out on August 1, 1914. For several days previous to that event, the Russian Government had been gravely concerned about communications with France. The two cables connecting Russia with Western Europe were owned by neutral companies, but that very "neutrality" appeared dangerous. Fortunately, complete apparatus for a big radio plant had just been made in the factory maintained by the Russian Wireless Society. It had been tested by military radio specialists, a temporary tower and antenna having been constructed for that purpose. On the initiative of the military authorities, the Military Electric School took charge of the property and on the same night the exchange of messages with the Eiffel Tower began. The first news of the declaration of war by Germany was sent to France from this station, commandeered on the eve of the war.

Everybody realized, however, that a hastily-constructed plant erected under an emergency could not be depended upon. Consequently, the Government intrusted several radio specialists with



Map of Asia, showing the war-time Russian radio telegraph nets

the task of establishing adequate and reliable radio-communication with the Allies. At this time, alternators with an abnormal number of cycles were not obtainable in Russia; D.C. generators could be obtained on special order only after considerable delay. Nevertheless, with assistance of the Russian Society the difficulties were quickly surmounted and one of the most powerful radio-stations of that time, with nine towers, each 360 feet high, was ready within four and a half months from the time the decision was made. In December, 1914 the Emperor Nicholas II was able to send his Christmas congratulations to the President of France and the King of England by wireless.

TVER TESTING STATION

One of the stations was erected at Tsarskoe Selo, the residence of the Czar, twenty-two versts (14½ miles) from Petrograd; the other at Moscow, in the heart of Russia. In addition, a special receiving station was built at Tver for testing and observation purposes. Tver is on the railroad between Petrograd and Moscow.

The Tsarskoe Selo and Moscow equipments were practically identical in design from a radio-electrical point of view. The arrangement was as follows:

A huge storage battery of 6,000 Tudor lead cells fed the condenser oscillation circuit. The total voltage of the battery was 12,000, the maximum current 25 amperes. To make the task of the personnel easier and for convenience in recharging the battery, it was subdivided into twelve separate parts of 1,000 volts each. The subdivisions each had a charging dynamo driven by a 22-volt D.C. motor. When the transmitting key was pressed, all twelve generators were connected in series by means of twelve corresponding automatic carbon relays, and connected in parallel with the battery. Thus the condenser was charged by both the batteries and the generators. When the key was released, the relays switched the generators to their corresponding sections of the storage battery. In that way, the storage battery received charging impulses in the intervals between the dots and dashes of the Morse code. The battery capacity was such that the transmitter could work at full power for about two hours when using only the storage battery as a means of primary current supply.

The oscillating circuit consisted of glass plate condensers of ½ mfd. capacity, silver-covered, copper-pipe, self-induction coils of large diameter and a solid revolving disk-discharger with twelve teeth, modeled after the discharger of the big Carnarvon plant.

INVERTED L ANTENNA

The transmitting antenna, of the inverted L type, was supported by wooden towers 120 meters, or 360 feet high. Nine towers were used at the Moscow station and seven at Tsarskoe Selo. They stood in two rows.

The wooden towers were erected for temporary use only. At Moscow they were replaced by iron towers in July, 1915 but they remained at Tsarskoe Selo until the end of that plant, December, 1919.

UNIQUE WOODEN TOWERS

The construction of the wooden towers, being original, deserves mention. Four parallel vertical tree-trunks, about 20 inches in diameter, were erected on a concrete base and were placed with a few inches clearance between them, forming a square. Iron tie-rods and bolts kept them together and reinforcing wedges, put between them, supplied a tension that gave greater solidity to the whole tower. The desired height was gained by adding the necessary number of trunks. A small crew of trained men could assemble such a tower in two or three days.

Cross arms served to support the transmitting antenna, of the cage type. A number of wells, 20 feet deep, provided the necessary ground for the transmitter. In addition, a counterpoise of many thick parallel wires was buried in the ground, one foot beneath the surface.

The receiving part of the station occupied a small structure, separate from the transmitting room. A single wire, stretched on top of the towers, served as receiving antenna. There were two of these, each with its own receiving apparatus so that two different messages could be picked up at the same time. The telephone receiver was generally used in picking up messages, although it was possible to receive them on phonograph records. The crystal detector and vacuum tubes were used in various combinations.

Power for the plant was delivered by Diesel generators. Four Diesels of 150 HP. each, with corresponding 220 volts D.C. dynamos were used at Tsarskoe Selo and two Diesels of 450 HP. each were used at Moscow. Each plant had one generating group held for reserve, the working power being 450 HP. in both cases.

The storage battery of 800-ampere hours could be used for the short time work, instead of generating groups. The same battery also supplied energy for various secondary uses, such as lighting, pumping, etc. Every device could be manipulated and controlled from the receiving house. Both plants were operated exclusively by officers and privates of the Military Electric School. Many of the privates received their only electrical and mechanical training after being drafted into the army when the war began.

War-Time Radio Activities

Throughout the war, up to the Bolshevist revolution in November, 1917, the Tsarskoe Selo and Moscow stations successfully maintained communications with the Allies. Both stations, together with the Tver testing station, were under the supervision of the Chief of Radio-Communication. Special wires connected the chief's office in Petrograd with each station, making them independent of the State telegraph lines.

As a rule, Tsarskoe Selo was in connection with Lyon, France, and Coltano, Italy, while Moscow was communicating with Carnarvon, England and eventually with Salonica, the headquarters of the army in the Balkans.

Tsarskoe Selo used a normal wave-length of 5,000 to 6,000 meters, while Moscow worked with a wave-length of 6,000 to 7,000 meters. The acoustic pitch of the transmitter was given by 400 oscillations per second, produced by the revolving disk-discharger, which had twelve teeth and made 2,000 revolutions a minute.

Exchange of messages was carried on during periods set by special arrangement between the Allies and communications proceeded practically uninterrupted within the schedule hours except on the night when Germany made her declaration of war against Russia. She then tried to prevent the transmission of that news from Russia to France. But even then, in spite of the attempted interference, messages were duly exchanged. This was accomplished by means of a quick change in wave-lengths, the arrangement to provide against such a contingency having been made in advance. Of course such changes are an inconvenience to a large station and force it to use wave-lengths which are not always to its advantage.

The daily average of words was about 4,000 for Tsarskoe Selo and little less for Moscow. Besides the messages in cipher, there were open messages consisting of communiques from Headquarters, meteorological news and astronomical time signals. The number of words transmitted and received could have been considerably increased if the automatic Wheatstone transmitter had been used.

From the very beginning of the work of the Allies, the daily traffic demonstrated the perceptible influence of topography upon the strength of the signals. Thus, while the messages between Lyon and Tsarskoe Selo were heard with great distinctness, those between Lyon and Moscow were very poor. A glance at the map will explain the reason of this. The straight line between Lyon and Moscow passes through the Alps and the mountains of Bohemia, while between Lyon and Petrograd the country is much more level. The Carnarvon and Coltano signals were heard with equal ease in Tsarskoe Selo and Moscow, although Moscow had the advantage in communicating with Carnarvon as it had a larger aerial.

In order to make the radiated energy as large as possible, both an earthed ground and a counterpoise were placed in the antenna circuit. It was found that the maximum of oscillating energy in the antenna could be obtained by cutting the inductive resistance into one of these parallel branches and ascertaining its most favorable size.

Much trouble was caused in cold weather by hoar-frost and ice. They are the real plagues of both the radio and wire telegraphing in some parts of Russia. The coating of frost and ice on the wires of an antenna increases its effective resistance and it was even more serious when the ice would accumulate to a thickness of several inches, thus increasing the weight of the antenna and threatening the safety of the towers. This caused especial concern when the high wooden towers were tried for the first time.

Therefore, on cold days particular attention was given to the antenna. At the first signs of hoar-frost accumulating, the antenna wires would be shaken by means of the hoisting cords but when there was a quick formation of ice, it was necessary to lower the whole antenna and the ice would be knocked off by hand. Later it was found that the antenna wires could be heated by an electric current. A few minutes after the current was turned on, the coating of ice would drop off in large sections, doing away with necessity for lowering the wires.

Recognition of the importance of the wireless telegraph in public affairs had just begun to spread among Russian officials when the revolution put a temporary end to its development.

Radio Necessary in Future Development of Russia

Generally, one may say without fear of contradiction that wireless will occupy an important place in the future development of Russia.

Russia is 10,000 kilometers in length from East to West and 3,000 kilometers from North to South, or 6,200 miles by 1,860 miles. Within this area are many wild and, under ordinary conditions, almost inaccessible regions. These spots often contain stores of treasures, concealing great riches. In many instances the climate and topography of the country make the erection and maintenance of wire telegraph lines impossible. For instance, the greatest gold mines of pre-war time were located in the Yenissei Taiga (virgin forests in the region of the river Yenissei), where the several thousand souls that made up the working population were completely cut off from the rest of the world for six or eight weeks every Fall and Spring. The intervening country was absolutely impassable.

For many years explorers have endeavored to navigate the Arctic Ocean along the Siberian coast. Shipping is absolutely necessary to the exploitation of the riches that Siberia contains, but to a great extent it awaits the time when a radio telegraph net is spread along this coast. The first steps in that direction have already been taken. Three stations have been built, one at Novaia Zemlia, one at Vaigatch and one at Yamal Peninsula, but these are all but lost in the vast expanse of the coast, and in fact barely touch Siberia at the northwest.

There is still another highly important field in which radio could be invaluable to the new Russia. Russia is pre-eminently an agricultural country. Consequently reports of probable weather conditions and market prices are very important to all parts. There are many places which cannot be reached in time except by radio. This is especially true after several years of general disorganization. It is only too evident that a main factor in Russia's recovery will be the radio telephone, the latest achievements of which are so brilliant. A number of broadcasting stations would keep the remotest corners of vast Russia in close touch with the rest of the world.

Lakes-to-Coast Voyage Has Thrills

Scenery, Accidents, Fishing and Radio Make the Trip Notable for the Operator on the U. S. Shipping Board Vessel *Lake Harminia*

By Julian K. Henney

ONE day I sauntered down by the docks at Cleveland to watch the busy tugs puffing laboriously around, and to listen to the waves of muddy Lake Erie swishing against the blue-gray hulls of two Shipping Board steamers tied to the wharf.

"Where are you bound?" I shouted at a greasy individual in faded blue jumper, evidently a member of the below-decks crew.

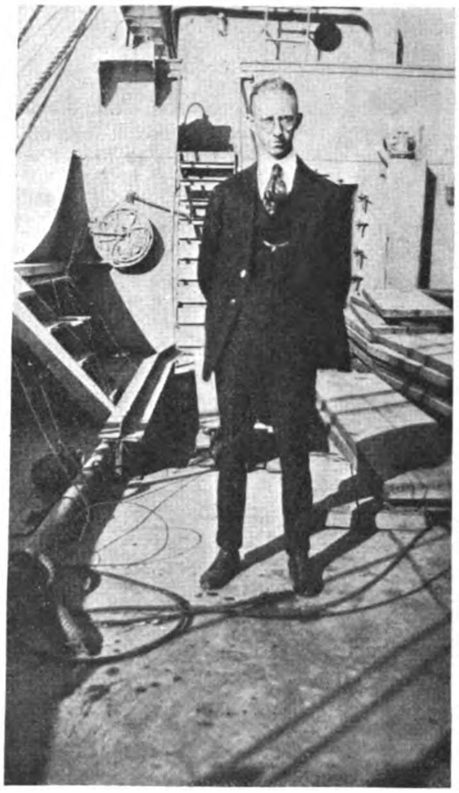
"Boston, I guess," was his disinterested answer.

Now Boston meant that the steamer would have to go out the St. Lawrence, a voyage I had always wanted to make. Perhaps, I thought, there are other Shipping Board steamers; some might even need wireless operators, so I hustled to the Radio Corporation office, and applied to Superintendent Nicholas of the Great Lakes' Division for a ship.

Two weeks later he sent for me and assigned me to the *Lake Harminia,* a new vessel, which was to sail from Superior, Wisconsin, for the coast. Another pleasant surprise was in store for me at Cleveland. I was to have company on the trip to Duluth and Superior. Keuhni, an operator friend, was to take the *Lake Glaucus* from the Globe yards where the *Harminia* was being finished.

We were told to hurry to Duluth, but it took a long time to pump eighteen cars of heavy oil into the steamer through a one-inch hose with a wheezy engine that threatened to expire at each breath.

When the *Lake Harminia* had taken her last supplies, the Skipper came aboard, and when the compass had been adjusted, paraded us over a good part of the west end of Lake Superior. Then we tied up at a grain elevator in the Duluth-Superior basin to have sixty thousand bushels of wheat shot into the hold. The next morning the rest of our ninety-odd thousand bushels came aboard, bringing us down to the maximum depth with which we could get past Cove Island into Georgian Bay.

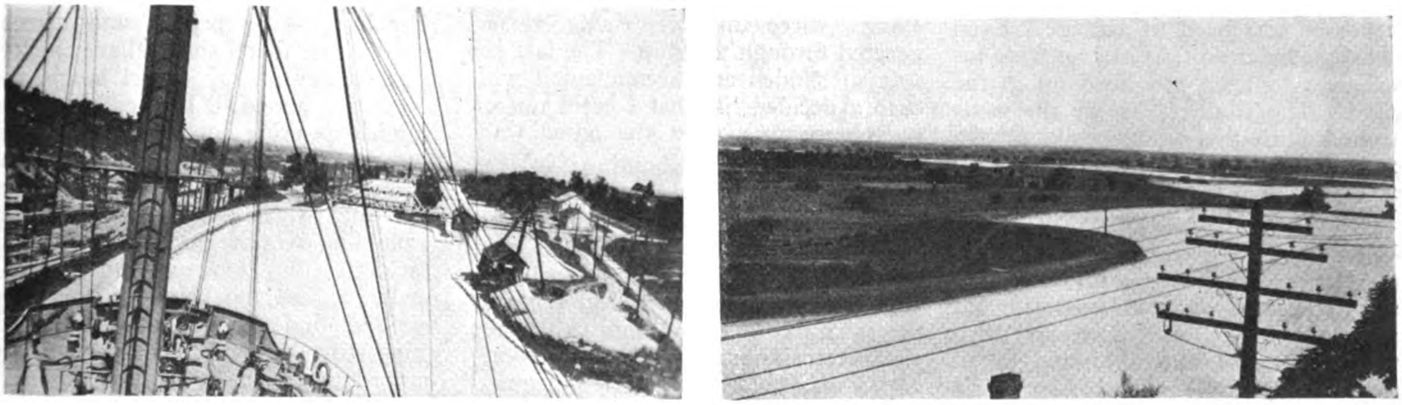


Safe on deck—operator and antenna

The two days' trip across cold Lake Superior and down the winding St. Mary's river gave me ample time to test the radio equipment on board.

A wireless operator's life aboard such a steamer as the *Lake Harminia* is a pleasant one. The radio room was a large, well-lighted and ventilated cabin on the afterdeck across from the chief engineer's room. The panel and desk took up but a small part of the large cabin, which provided a cozy haunt for all the ship's officers. The bunk room was equipped with three bunks, but as I could use only one at a time, I could shift around according to the weather and the movement of the vessel. Electric fans in both rooms, clothes closets, brass Seth Thomas clocks that actually kept time, curtains at the port holes—all this and more proved to me that a radio man's life was not so bad as I had sometimes found it. The motor generator was in the engine room with a push button near the receiving tuner to start it, so that the whine of this high-speed, 500-cycle generator did not bother the operator while receiving.

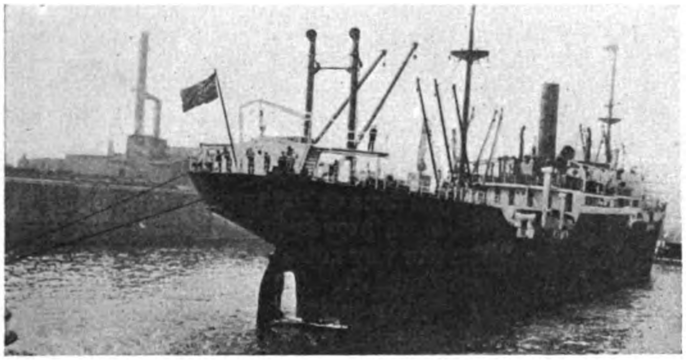
Late one afternoon we anchored off Cove Island at the entrance to that winglike projection of Lake Huron, Georgian Bay. A fog had come down on us as we attempted to steal past the sentinel-like island, forcing us to lay up until the next morning. The next day we tied up at a grain elevator at Port McNicoll, around the corner from Midland, VBC., and a fishing party was organized among the officers. By noon our party of Isaac Waltons had pulled nearly a hundred fish from the blue waters near the ship.



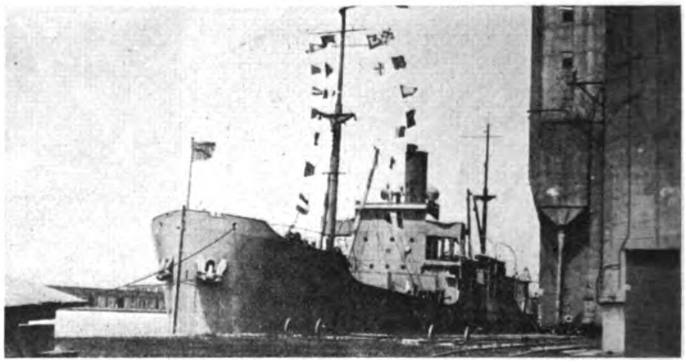
These views were taken while going through the famous Welland Canal between Lake Erie and Lake Ontario. The latter lake is dimly seen in the distance

Early on the next morning the elevator men were ready to drop their long proboscis-like chutes into the hold to take out our wheat. The elevator gear got mixed up with the aerial in the process with the result that I made an impromptu trip up the mast. Forgetting that the aerial might be as heavy as myself, and not realizing that I could not snub a steel cable as I could a rope, I unloosened the wire rope. When the last turn was taken off, whist! I started up the mast; the wires started down. Had it not been for two sailors nearby I might have suffered more damage than a pair of bruised hands.

Coming out of Georgian Bay we passed Cove Island at midnight. The *South American* called shortly before asking about weather conditions in the Bay. She, too, had been running through fogs from one of the lakes to another. The evening of the next day we passed the many lights of Detroit. On account of the thick weather, the Skipper anchored as soon as it grew dark. A message to the Marine Post Office at Detroit failed to get any results, but the music that came floating over the aerial a half hour later appeased the crew.

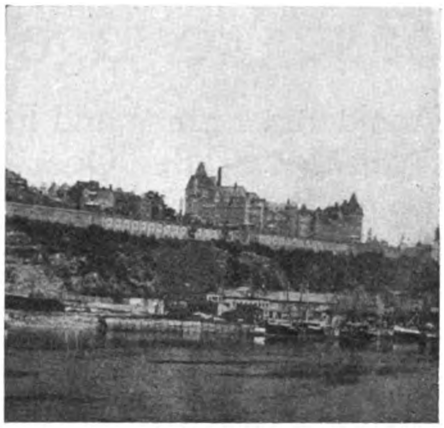


A trophy of war, the S.S. "Greiffenfels," a former German liner now under British flag, at Montreal



The "Lake Harminia" docked at Port McNicoll, waiting to discharge her cargo. The flags celebrate July 4

The short distance through the canal between Lake Erie and Lake Ontario proved to be like the old road to Rome—long and tedious. The steamer had been built as large as possible, and in the small canals and locks she was hard to manage. Even the eight hundred tons of coal were insufficient to keep our head up in the wind. The slightest breeze threw us around until the clank, clank, of the propeller on the stony bottom forced us to tie up. Messages went back to Cleveland, "Tied up in strong gale near St. Catherines."



Quebec's waterfront dominated by the Citadel and the Hotel Frontenac

After a long siege with the canal and its locks it was good to steam out into open water once more, and then to enter the beautiful island-dotted waters near Clayton and Alexandria Bay, which were passed in a cold drizzle, yet the magnificence of the far-famed Thousand Island district was not dimmed by the weather.

Taking a pilot at Ogdensburg, we entered the first of the St. Lawrence locks shortly after noon, passing around the Rapid Plat rapids that tumbled beside us or left us peacefully puffing along while they hurried in a welter of foam around the rocks and islands. At supper time we anchored in a small widening of the river called Garbage Lake by our uncomplimentary mate, an incongruity that I could not understand.

Just as we were clearing the last of the forty-eight locks, and mates, engineers and deck hands were eagerly looking forward to Montreal and the end of canals, and were congratulating ourselves on the progress, when, Bang! three distinct thuds reverberated through the ship. The last jar was so sudden and accompanied with such a decided list that I went out of my chair, up against the outer wall.

The captain was shouting; so was the mate and the pilot, and by the time I had the receivers off my ears a dozen of the crew were running wildly up and down the lock wall. A glance out the wireless room revealed the stern of the vessel high in the air, the aftercabin more or less wrecked, and a disabled rudder post and quadrant hanging loosely like a broken arm. In some manner the rudder had caught on the cement base of the rear lock gate, so that when the water was let out, the steamer sat down on her foot, figuratively speaking.

Another Shipping Board Steamer coming up behind us in the gathering dusk had heard the noise, had seen us list, and soon radioed asking if we needed assistance.

"A week in dry dock," was the concensus of opinion.

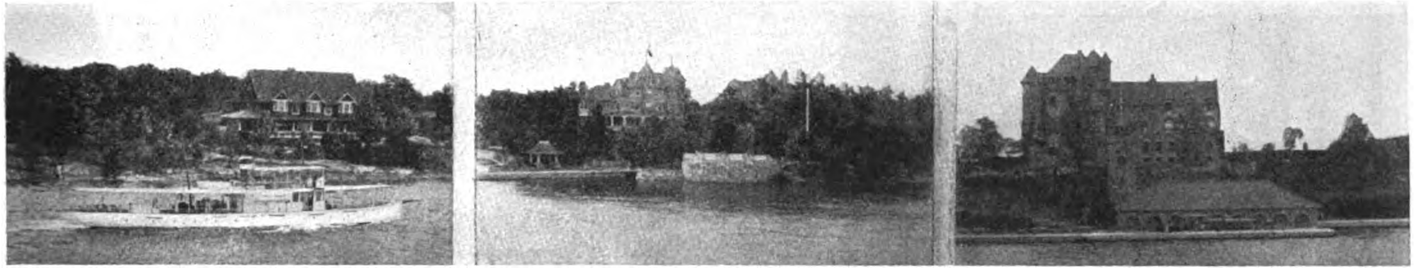
Two tugs came for us in the morning, towing us through the last of the Soulanges Canal, then through the Lachine Locks. Aided by a third blue, red and white stacked tug later in the day we were finally pulled into Montreal shortly afterward, thirteen hundred miles from the *Harminia's* home port, a city she would never visit again.

For the next ten days we sat around in intense heat, in an evil-smelling slip, watching repair men grapple with a job that was evidently too large for them.

Finally, I jumped on a Canadian Pacific train, traveled past Lake Nipissing, Algonquin Park, through the rocky wilderness of the north to the Soo from where I went by "bus" to Les Cheneaux Islands for a fishing trip to last until the rudder would be fixed.

After receiving word that the steamer would sail soon, I went back to Montreal to find that the boat had been in Quebec for nearly two weeks. Arriving in the city at night I found only French speaking people, and discovered too late that I should have worked a bit harder on my school languages. Over the phone I learned from an English-speaking operator—may her days be blessed!—where to find the steamer, across the river from Quebec, and three miles from there. Stumbling over the many labyrinth-like tracks of a dry dock and ship yards, I finally walked the plank of the *Harminia* to find the second engineer arguing with the mate that "Sparks" had jumped the ship.

We bid goodbye to drydock, finally, one month after being towed into



Views among the Thousand Islands, the unsurpassed Summer resort of Americans and Canadians along the St. Lawrence as it issues from Lake Ontario

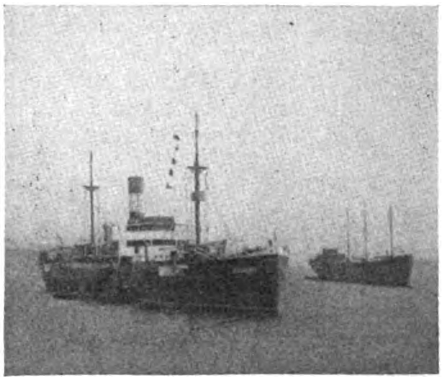
Montreal with a wrecked rudder. The next day we made a trial trip around the harbor, had our compass adjusted again, and at 2 o'clock sailed past the Isle of Orleans bound for Chatham, New Brunswick, for a cargo of pulp wood.

The St. Lawrence began to show signs of its greatness as soon as we had passed the Falls of Montmorency, which are higher than Niagara, and beautiful in the afternoon sun. The river increased in width, and the shores became higher and more rugged, and soon the fresh water became salty. Toward evening we passed the mighty promontories that guard the entrance to the Saguenay River, and at four in the morning we dropped our pilot at Father Point, the spot where the great *Empress of Ireland* sank a few years ago.

During the night the receivers were bothered some by static, but signals of ocean-going vessels were not scarce. Once I heard one send a long string of supplies that some one would need for the long Winter soon to fall on the inhabitants of that north country, and an hour later heard the same message being repeated along the river from point to point like a distant echo.

The evening of the next day we ran into a heavy northeast sea off Pluris Point that tumbled the *Lake Harminia* about like a cork. When the darkest of St. Lawrence nights came down on us, the captain slowed down and drifted and coasted slowly along the shore until daybreak should allow him to make sure of his position.

Late in the afternoon we dropped the hook in the mouth of the Mirimichi River, patiently waiting until the pilot should come up in his sail boat to take us up to Chatham, fifteen miles away. We rode at anchor off the village that night, and in the morning moved to the pulp-wood dock. Here I saw the tall masts of a Canadian high-power station at Newcastle, VAL, I believe. We took a thousand cords of wood at this port while the chief and I went trout fishing in the wilds behind the town. While here I watched a German steamer under a British flag burn at the dock, and saw a four-masted hooker from Norway unfurl her sails and fly away like a huge white butterfly.



Journey's end. Ships at anchor in Portland Harbor, Joaziero in foreground

Clearing for Portland, we followed the southern coast out through the Gut of Canso to the Atlantic. In the evening the receivers were filled with a medley of notes ranging from the pure tone of the *Mauretania,* MGA, to the buzzsaw of a lonely Jap trying to get through the jam to WSE. Before Arlington time, 1HAA, 2JU, and 2NF came buzzing in with their low-toned, low-wave sets. It seemed like home to hear those 200-meter fellows pounding away, and when NHR at Cleveland came roaring in louder than NBD at Bar Harbor, the Lakes didn't seem so far away as I had thought.

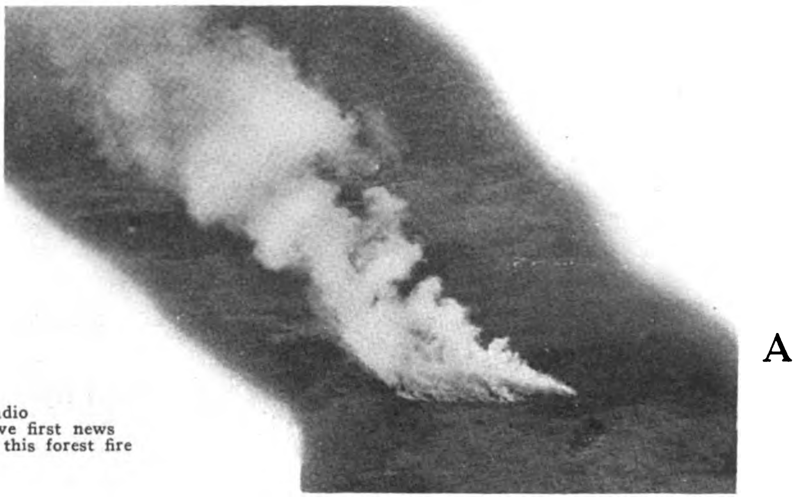
The following day was spent blundering south in a fog that came down early in the morning. We were off Cape Sable, but because of some oversight the captain did not have a book dealing with the Canadian fog whistle characteristics. A message to VCU brought the captain the information he needed to proceed. During the morning we nearly ran down a lone fisherman who had anchored in the fog off the Nova Scotia coast. Once we scraped a black buoy that marked a reef, and once were too close to a white vessel that rushed at us out of the mists and then flitted past like a bat at night. At noon I worked PUH, the *Joaziero* of Rio, who was coming across from England with a cargo of chalk.

Several times I secured an answer to my QTE request from Bar Harbor enabling the captain finally to clear the Cape and head across the Bay of Fundy for Portland. Here we anchored, and I decided that night as we watched the *Joaziero* drop anchor near us that radio life aboard such a steamer as the *Lake Harminia,* and on such a voyage as the Great Lakes to the Atlantic coast was a great life.

New Equipment for Army Airplanes

AIRPLANES in the service of the United States Army are to be equipped with radio apparatus of new and advanced types, including combination telegraph and telephone sets. The installations are of three types, designed for the three different types of airplanes, the pursuit, observation and bombing planes. Development of the new radio apparatus has been in the hands of the Signal Corps Radio Section, and although the plans have been drawn and bids called for, no public description of the apparatus has been released by the Signal Corps. It is said, however, that it is far in advance of present sets.

The largest and most powerful set, known as S. C. R. 135, will be carried on bombing planes, and will have a radio telephone radius, plane to ground, of 75 miles, and a telegraph range of about 200 miles. S. C. R. 133 is designed for the most speedy pursuit planes, and has a telephone range of 5 miles, S. C. R. 134, for observation planes, will have a range of about 10 miles. These sets all use a trailing wire for the antenna, and the metal parts of the airplane as a ground. Army experts consider that the new instruments will practically revolutionize radio for airplane use.



Radio gave first news of this forest fire

Radio Telegraphy Is Great Aid in Fighting

Forest Fires

A Radio Observer Tells of His Work

By M. V. Chesnut

FIRE!

Fire in the forests that guard the cultivated fields of the Western states! The trees are threatened, and that means catastrophe, for with the woodlands rests assurance of an equable distribution of rainfall over a wide area of fertile farming land. Let these trees burn, and the farms that now supply an important percentage of American foodstuffs would dry and harden into another Sahara.

Fire! An airplane patrol detects it while still a small blaze; a bush fire, but one that may involve a hillside. The observer in the airplane notes the arising smoke, spots its position on the map before him in its celluloid cover, and puts his fingers on the key.

DAR TEH DAR DEH DAR.

And back to the radio-observation airdrome goes a short message that says in code, about as follows: "Bushes afire in XYZ valley point about 145 north 72 west."

The operator at the airdrome copies the message and hands it to a telephone operator, who quickly consults his map, finds the location of the fire, and telephones to the nearest Forest Ranger. The latter goes quickly to the spot, summoning aid if necessary.

And once more the vital woods have been saved, and with them the cultivated fields that depend upon them.

Such is the procedure at the High River Air Station, typical of all the others. This station was established last year for the fire protection of the forests on the Eastern slope of the Rocky Mountains, and radio plays an essential role in the work. Regular observation trips are made each day, lasting from two to three and even four hours, and if it were necessary for the airplane to return to headquarters every time it sighted a fire, much valuable time would be lost with the conflagration meanwhile growing to much larger size.

The radio station and airdrome are situated forty miles east of the Rockies, and are apparently in an ideal location from a radio standpoint, judging from the transmitting ranges obtained. The aerial is a four-wire umbrella type and is supported on a 185-foot steel mast. Four down-leads are taken from the mast head and led to the transmitting room.

The station's transmitting equipment consists of a 2 kw. synchronous spark set with a daylight range of 600 miles on 900 meters. Current is supplied by a generator driven by a gasoline engine.

During the tests that were made to determine the range of this set a vessel was heard sending traffic to KPE (Seattle). When the ship signed off, it was called, and its position asked. The reply showed that it was three days out of Seattle, a third of the way across the Pacific, bound for Yokohama. This long-distance transmission probably released some profanity aboard ship, for just as the key was pressed to acknowledge the ship's message the gasoline tank ran dry and the current stopped.

Radio observer in DH-4 airplane, about to start on his daily forest patrol. The man on the ground has his hand on the 600-volt generator that supplies current to the radio transmitter

While the operator ran out to one of the De Haviland airplanes to "milk" it of some gasoline the irate ship's operator called VAW (High River) again and again, finishing up finally with a string of QRA's and WHO's without getting a sound in reply until the gasoline engine had been started again.

An aircraft type of C. W. and phone transmitter with a power input of 100 watts is also installed in the ground station and operates with excellent results. Owing to the large aerial, it was at first impossible to transmit on amateur wave-lengths in the usual manner with the original apparatus. This difficulty was finally overcome by using the "syphoning" system, i. e., very loose coupling. With this method, using a sustained wave, the radiated wave-length is that of the closed circuit, regardless of the period of the aerial system. Concerts broadcast from this transmitter on a wave-length of 360 meters have been heard as far distant as Chicago, 1,600 miles away. Great credit is due to the amateurs of the southwestern states, whose detailed reports and helpful criticisms were of assistance in bringing this radio telephone transmitter up to its present efficiency.

Receiving Equipment

The receiving equipment is of the very latest type, and consists of a seven-valve radio-frequency amplifier with a wave-length range of 600 to 5,000 meters. The use of regeneration is optional, and it has been found possible by regenerating to receive even 200-meter signals, with no great loss of efficiency. However, in copying the reports from patrolling aircraft, a syntonizer is used as an external heterodyne, in preference to regeneration, owing to the ease of tuning this circuit. This simplicity of control is no small factor, for the C. W. signals from the patrolling aircraft "swing" considerably when the airplane encounters rough weather, owing to the changes taking place in the wave-length of the trailing aerial of the transmitting airplane. Every time an airplane dips into an "air hole" the antenna has a crinkle put in it, thus changing its fundamental length.

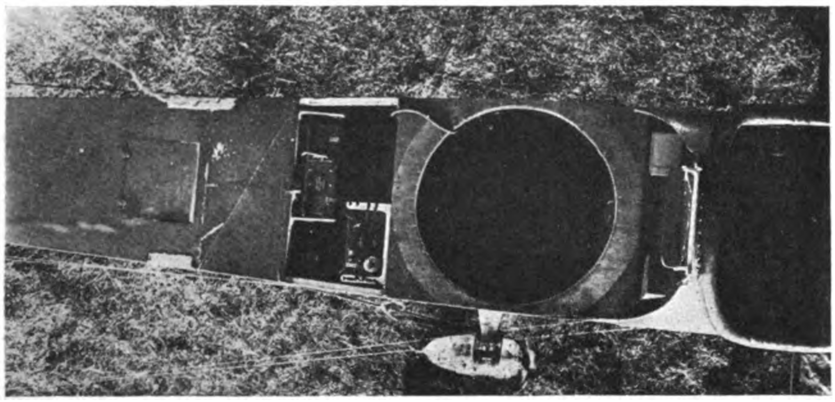
Mountain scenery affords remarkable views from above, but the air over these ranges is "bumpy," the varying pressures and cross currents tossing the airplane as on a stormy sea

Airplane Equipment

The airplanes are all fitted with C. W. transmitters, some using a 100-watt type with a modulating attachment for telephony, and the remainder using 40-watt types on straight C. W. All the transmitters use the standard British R. A. F. circuit that has become almost universal on airplanes.

There is just one danger created by the radio set on an airplane, and that danger is run by the men on the ground. The antenna consists of a single trailing wire, which is wound on a small winch and is lowered only when the machine is safely off the ground. It is supposed to be wound up again as the pilot prepares to land, but the radio operator who is new to aircraft work usually forgets to crank up the antenna in the excitement of getting back home after the first few flights.

The two-pound lead weight on the end of the antenna comes down first, hits the ground with a thud and bounces like a foot-ball. By the time the weight has come down again, some of the wire itself is twisting and curling along the ground, ready to wrap itself around the whole ground staff and hold them for the attentions of the weight, by now parted from the wire and hitting only the high spots. Rather than be one of those spots, the ground staff either tries to keep both feet off the ground at the same time, or makes for the mountains, 40 miles off.



Looking down into the radio cockpit. The wind-driven generator is shown on the starboard side. Transmitting and receiving equipment is seen in the space aft the cockpit. Boxes of spare tubes are carried in the forward compartment

The inevitable question asked by amateurs who visit the airdrome is: "How do you get your ground connection while in the air?" Prospective visitors are hereby advised to think twice before asking that question as the staff is "fed up" on it. The answer now is likely to be that the operator throws out a sky-hook and uses a cloud!

Naturally, the counterpoise system is used. Every airplane, whether radio-equipped or not, is fitted with copper strips connecting all the metal parts of the machine to the engine bed. This is done to afford a safe path for electricity generated by friction, and as a protection against differences of potential that may be encountered while flying through clouds. The network of metal ribbon not only prevents sparks but makes an excellent counterpoise for the antenna of the radio set.

The best results are obtained when the transmitter is connected at the nodal point, or in other words, in the electrical middle of the radiating circuit; therefore, the length of the lowered aerial should be just sufficient to balance the capacity of the counterpoise. Fortunately, in the type of aircraft used, the wave length of the system when thus balanced is approximately 900 meters, the official Aircraft wave assigned by the Berne convention.

Receiving equipment is installed in some machines, but is not generally used owing to the hardship of wearing headphones. The radio-observer must wear the phones under a tight-fitting flying helmet, and in spite of sponge-rubber and pneumatic ear-protectors, the pain in the ears becomes unbearable during a three-or four-hour patrol. One-way communication is customary, for if the receiving operator on the ground is alert, there is little or no danger of messages being missed.

Personnel

The radio staff of the High River station consists of a number of radio-observers headed by the wireless officer. The latter is a skilled radio-technician who is responsible for the maintenance of the ground station, and is in charge of all experimental work.

The radio-observers are required to have some knowledge of photography in addition to their radio and eyesight qualifications.

An early question that had to be answered was whether a photographer could be trained in radiotelegraphy as quickly as a radiotelegraphist could be trained in photography. After careful consideration, the authorities decided that radiotelegraphy was the more skilled of the two trades, and radio operation was chosen as the primary qualification, photographic instruction being given to those needing it.

Each man is responsible for the equipment in his machine, and is required to inspect and overhaul the radio gear before every flight. When not on flight duty they also operate the receiving station on the ground.

Operating Conditions

Every morning of the Summer months two machines leave the airdrome, one flying south to the international boundary and the other north to the Clearwater district. Each airplane carries a pilot and radio-observer. The radio is in constant use during the patrol, transmitting position, weather and engine reports, and detailed observations on the humidity of the forests, with the consequent fire danger.

The observer keeps a sharp look-out for forest fires, and on spotting one, immediately transmits the location and other details to the ground station, where it is telephoned to the waiting forest rangers in their huts. Subsequent messages report the extent of the damage and the progress made by the fire-fighters. It is customary for the observer to photograph the fire also, in order to confirm his estimated location and for filing reference.

The location of every camp spotted within the Government forest reserves also is wirelessed to High River and filed there, so it behooves the camper to be mighty careful with matches, cigarettes, and camp fires, as fires originating in their vicinity will quickly be brought home to them.

There is always a fly in the ointment. Though the life of an aircraft wireless operator is very pleasant on the whole, the special hoodoo of his existence is the "bumpy" weather encountered above the mountains. The poor "Op" is tossed around in his cockpit like a pea in a baby's rattle, one hand clutching his key and the other clinging to any nearby strut or stay. It is most amusing to listen in on the ground to the stuttering Morse of an operator on his first flight in bad weather. Only a man gifted with a wonderful imagination will ever read it!

It is a rule of the station that no transmission shall take place while the 'plane is changing direction, the reason being that the trailing antenna forms a half-loop during the turn, increasing the wave-length by several hundred meters at times, making it impossible for the receiving station to be kept tuned in.

Radio compass stations are needed in connection with this forest and mountain work. If compass work were practical, a pilot could hover above a forest fire while several compass stations obtained bearings, thus fixing the location of the fire beyond all doubt. Unfortunately, it has been found impossible to utilize the radio compass in the Rocky Mountains, owing to the errors introduced by the irregular masses of rock. When on board ship, the radio compass has to be corrected by a certain amount at each point of the compass, to allow for deflection of signals by the body of the vessel. This is a known and constant error at each degree, and does not vary as there are no other objects near by to introduce unknown factors.

At first it was thought that a similar factor of error could be worked out for each airplane, but it was quickly found that the character of the land over which the machine flew had an influence on the directional quality of the signals, the effect being far greater than that of the body of the airplane itself. Tests showed that the error might be plus 60 when the machine was 40 miles away, and minus 12 at 60 miles distance, though the airplane had flown in a straight line and the bearing had not changed in the slightest. Radio direction-finding therefore had to be abandoned, regretfully, and fires still are located on maps carried by the observers.

Plans have been drawn up for substituting telephony for the straight C. W. during the 1922 fire season. The machines will carry 100-watt radiophones and regenerative receivers, and a high-powered radiophone has already been installed in the ground station. At the time of writing, this transmitter is broadcasting music every Tuesday and Friday evening, and has been heard in Honolulu. With such a range, it may safely be predicted that Western amateurs will listen in this Summer to some highly edifying conversations between VAW and the the storm-tossed, air-sick operators aloft!

Station of a forest ranger, seen from the air. The rangers here are ready in a moment's notice to fight distant fires reported by the radio patrol

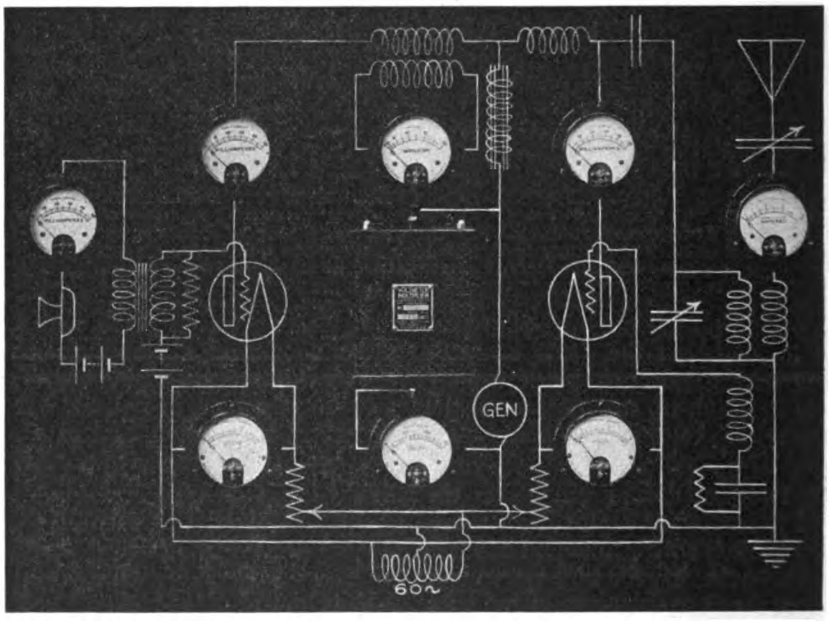


Diagram of a continuous wave transmitter, completely equipped with indicating instruments exhibited by the Jewell Instrument Company at the recent Chicago Radio Show, held in the Leiter Building

Some Measurements of Telephone Sensitivity*

By Miss Helen H. Smith,

Assistant Physicist, Bureau of Standards

THE general problem of the study of radio transmission between a sending station and a receiving station includes as one of its most important features the measurement of intensity of the signals produced at the receiving station. Since in nearly all radio receiving stations a telephone receiver is used in the production of sound from electrical power received from the transmitting station, most methods of measuring the intensity of received signals involve a consideration of the telephone receiver.

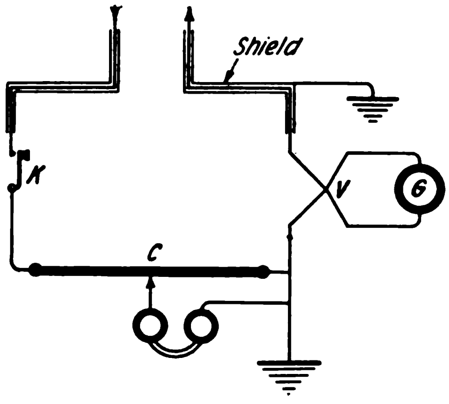


Figure 1

Fig. 1. Diagram of testing circuit.

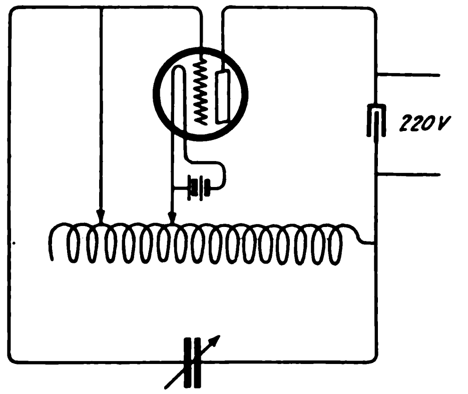


Figure 2

Fig. 2. Oscillator producing vibrations in testing circuit.

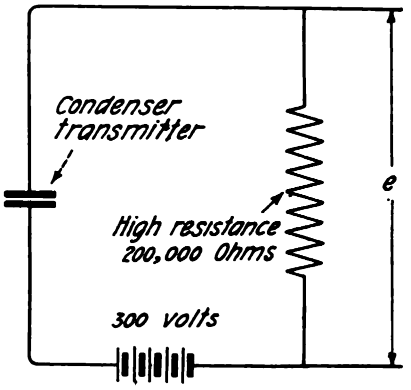


Figure 4

Fig. 4. Condenser transmitter diagram

Certain methods involve definite assumptions as to the properties of the telephone receivers, such as a linear proportionality between the current through the telephone receiver and the intensity of the sound produced by this current. In addition, some radio transmission experiments in which signals were received from both spark transmitting stations and modulated undamped-wave transmitting stations have called particular attention to the need of studying the response of telephone receivers to currents having various wave forms.

The method most commonly employed for measuring the intensity of received radio signals is the "shunted telephone method." This has been described by Zenneck, and adapted to autodyne or oscillating audion receiving circuits by Austin. In this method the telephone receiver is shunted by a variable resistance which is reduced until the signal is just audible. The intensity of the sound when the shunt is disconnected is given by the ratio of the current through the telephone receiver to the current required to produce the just audible signal.

Experiments to Determine the Current Necessary to Produce a Just Audible Signal

Preliminary work was done on the establishment of a standard just audible sound, using current of sine wave form. This standard is taken as the least audible sound at which dots and dashes can be distinguished from one another when the current is thus interrupted to produce signals of the radio code. This standard just audible sound then determines the voltage which must be applied to a given telephone receiver in order to produce the standard sound.

Variable Behavior of Human Ear

A pair of Western Electric Type P-11 telephone receivers was taken, more or less at random, although it was a pair which the observers in the laboratory had termed good. One of the two telephone receivers was connected in a circuit diagramed in figure 1.

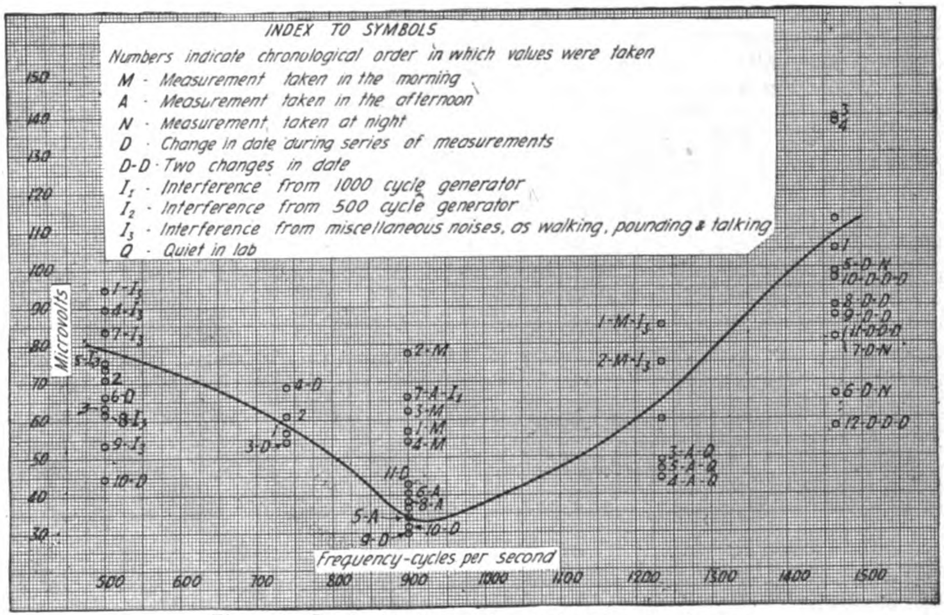


Figure 3—Graph showing results obtained by one observer

Power was supplied to the circuit of figure 1 from a transformer (not shown) in the oscillating circuit of figure 2.

The measurements immediately showed the variations in any standard thus defined solely with reference to a human ear, and for this reason are presented here. The human ear varies in sensitiveness from time to time depending upon the physical condition of the individual and upon the conditions under which observations are made. The results obtained by one observer are shown on the graph, figure 3. At the time the observations were made, and before the results were calculated, the conditions under which the observations were taken, were carefully noted. The results vary, and the point to be emphasized is that the variation is not necessarily in the sensitiveness of the receiver or change in any of the apparatus, but it is in the ear itself; the wide variation represents the importance of the personal factor in the measurement. The results may be easily analyzed; the graph shows that the ability to listen increases until the ear becomes fatigued, after which time the results show a continued increase in the voltage necessary to produce a sound audible to that particular ear.

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USE OF CONDENSER TRANSMITTER AS AN ARTIFICIAL EAR

On account of the variable behavior of the human ear, it would be an advantage in many measurements of signal intensity and telephone sensitivity to have a mechanical or electrical system which would be responsive to sound input and give an indication on the scale of a galvanometer or similar instrument. Such an artificial ear is the condenser transmitter which has been described by Wente. The condenser transmitter is especially useful for the comparison of sounds, although by proper calibration it could also probably be used in the absolute measurement of sound.

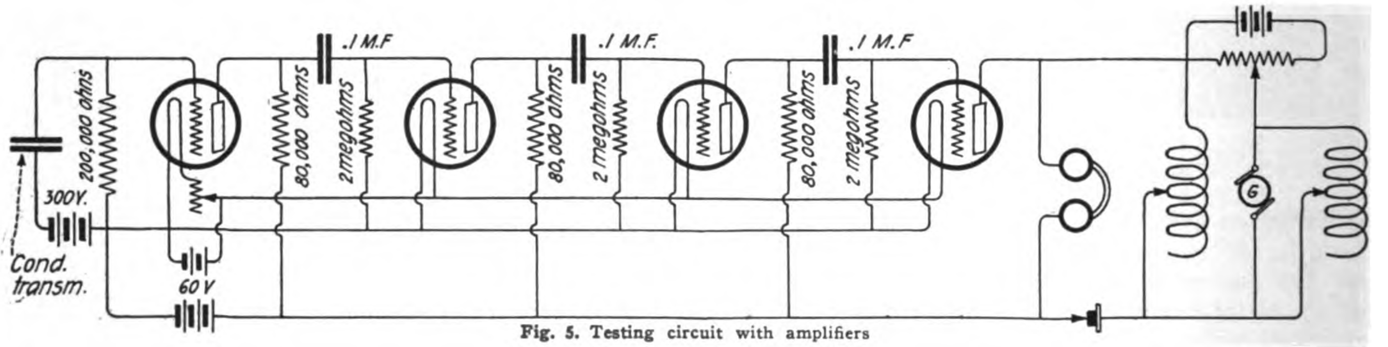
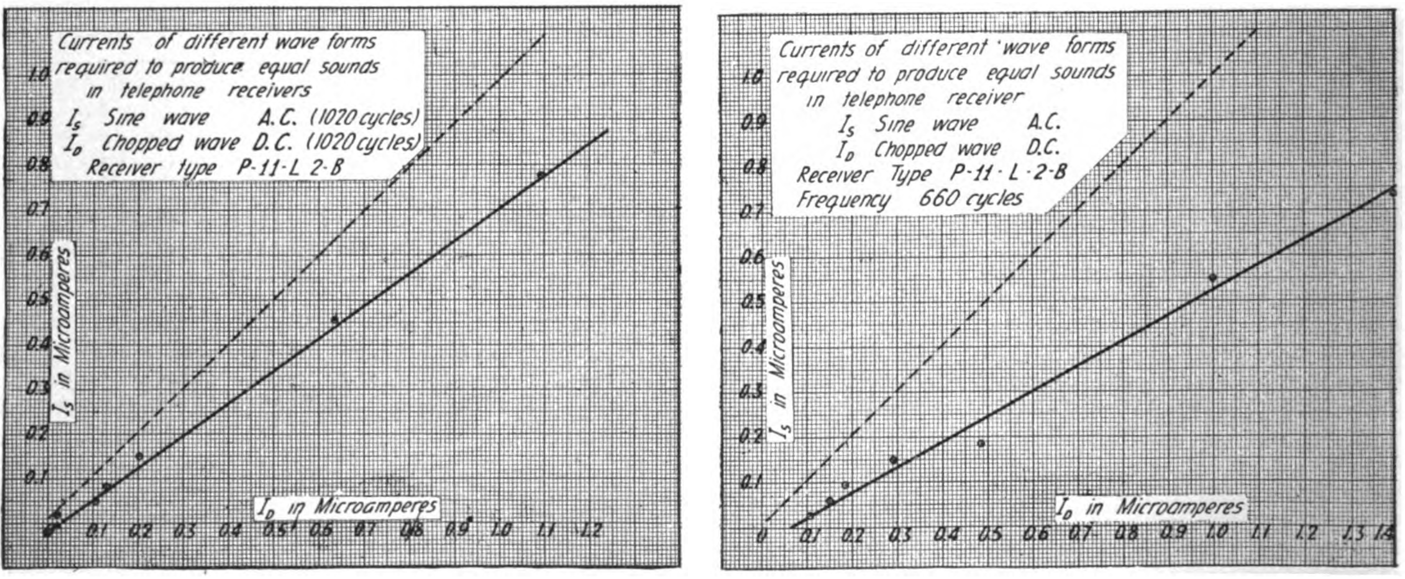


Fig. 5. Testing circuit with amplifiers

The condenser transmitter is, first of all, a condenser of two parallel plates with air as the dielectric between. The rear plate is of heavy gold-plated steel and forms the back of the instrument. The forward plate is of very thin steel, stretched to its elastic limit, which is used as a vibrating diaphragm. This arrangement presents a typical air-damped vibrating system with high stiffness and damping provided by the air film between the plates. The narrower the air film, the more sensitive the transmitter to pressure upon the diaphragm when the condenser is charged with voltage of 200 to 300. When such a condenser is set in the circuit shown in figure 4, the effect of impressing upon the diaphragm the sound waves from a human voice or from a telephone receiver is to cause the diaphragm to vibrate, changing the capacity of the condenser periodically at a frequency corresponding to the frequency of the sound. The result of this change in capacity is to produce an alternating potential drop across the high resistance. Thus, the condenser transmitter performs qualitatively the same function as a telephone transmitter, with the important exception that the alternating potential drop across the resistance for a given amount of sound energy, by proper adjustment of the damping film of air and the area of the diaphragm can be made nearly independent of the frequency. Thus, it provides an unvarying "ear" of uniform sensitivity at any frequency, which can be used to measure or compare sounds in terms of an alternating potential drop. Since this alternating potential drop for small sounds was quite small with the condenser transmitter used in this laboratory, it was amplified by a 4-stage, resistance-coupled amplifier, and its magnitude then indicated by the output from the amplifier through a carborundum detector and a DC wall galvanometer. The relation between the deflection of the galvanometer and the intensity of sound applied to the condenser transmitter is thus quite complicated, but a calibration of the galvanometer reading in terms of the intensity of the sound is unnecessary, if the system is to be used only in adjusting the two sounds to equal intensity.



Figures 6 and 7—Graphs showing currents of different wave forms required to produce equal sounds

The circuit arrangement is shown in figure 5. Many preliminary experiments were made upon this circuit before an arrangement could be devised in which the deflection of the galvanometer would correspond consistently to the sound input to the transmitter for all frequencies.

Two different kinds of relative measurements were made. (1) Sound produced in a telephone receiver by alternating current of approximately sine wave form was used as a standard of comparison. Measurements were made of the current in the same telephone receiver but of other wave forms to produce equal sound. Figures 6 and 7 show the currents to produce equal sounds in the telephone receiver L-2B. The currents compared were of approximately sine wave form and rectangular wave form respectively. The following table gives the ratio of sensitivity for pulsating currents to sine wave currents at different frequencies to produce equal signals.

(*Continued on page* 96)

Selective Receiving System Employing Multiple Detectors

A SELECTIVE receiving system employing multiple detection has been designed by Harold W. Nichols. It is based upon the principle that when a receiving station adapted to co-operate with a low-power or "weak" transmitting station, receives energy from a high power or "strong" transmitting station, interference results, the measure of which is determined by the intensity of the signal current received from the "strong" station relative to that from the "weak" station and to some extent upon the relative frequencies of the waves radiated from the two transmitting stations. Hence, when two such stations employ frequencies which are close together on a percentage basis, i. e., the ratio of the frequency of the interfering to selected waves is large or that of the difference—frequency relatively to that of the desired waves—is small, selection at the receiving station of the signal currents radiated from the "weak" transmitting station is extremely difficult with the arrangements heretofore devised.

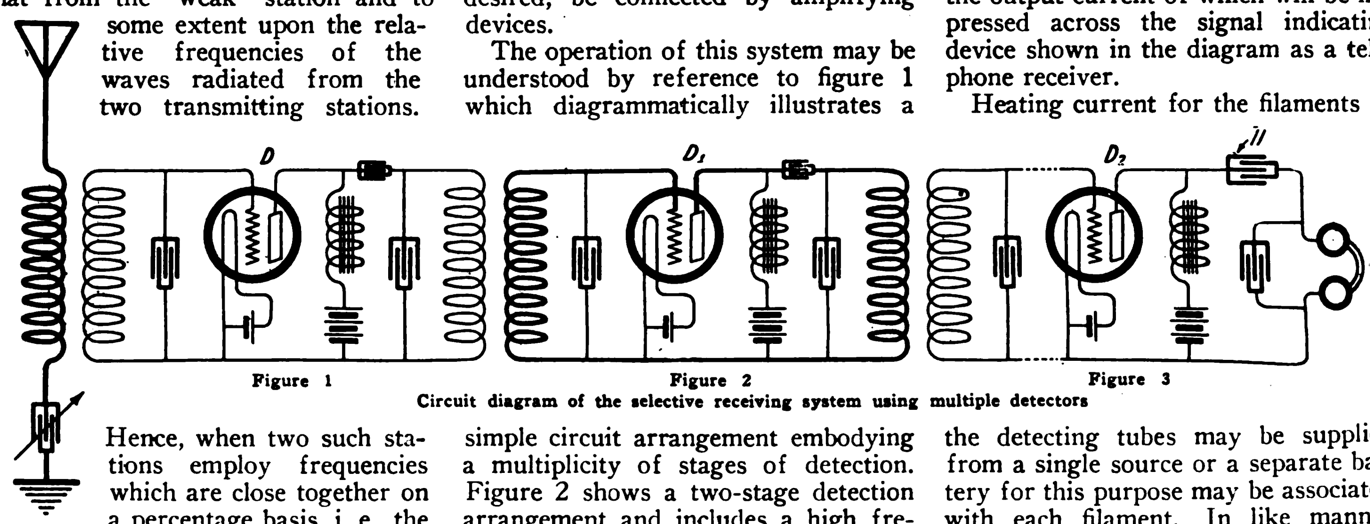


Figure 1 Figure 2 Figure 3

Circuit diagram of the selective receiving system using multiple detectors

This circuit employing multiple detection provides an arrangement which is selective of a current of low intensity compared to a strong interfering wave of frequency relatively close to that of the current to be selected, and means for eliminating interference due to a current of large amplitude relative to that of the current which it is desired to receive.

Advantage is taken of the fact that because of the curved characteristic of most detectors, including the vacuum tube type, if a speech or other signal modulator carrier current is impressed on its input circuit there will be present in the output circuit the signal modulated first even harmonic of the carrier frequency and by tuning the output circuit of the detector and the coupled input circuit of the next detector to this first even harmonic considerable selectivity will be obtained.

With this circuit the carrier wave received is impressed upon the tuned input circuit of a detector device from the output circuit of which the first even harmonic of the carrier frequency is selected and applied to the input circuit of a second detector device from the output circuit of which, in turn, the second even harmonic frequency of the carrier wave is selected. This process may be continued for any desired number of stages and the detected audio-frequency signal current of the last stage is supplied to a telephone receiver or other indicator. The various stages may, if desired, be connected by amplifying devices.

The operation of this system may be understood by reference to figure 1 which diagrammatically illustrates a simple circuit arrangement embodying a multiplicity of stages of detection. Figure 2 shows a two-stage detection arrangement and includes a high frequency amplifier, the amplifier and detectors being shown diagrammatically, and figure 3 shows an arrangement involving three stages of detection, and a plurality of stages of amplification for both the high frequency and the audio frequency currents.

Referring to figure 1, an antenna, tuned to the frequency of the incoming waves is inductively coupled to a resonant circuit also selective of the carrier frequency, which is connected to the input terminals of the detector D. The detector herein shown, by way of example, as a three-element vacuum tube has included in its plate circuit a selective circuit tuned to the first even harmonic of the frequency of the incoming carrier waves.

Inductively associated with this circuit is a resonant circuit tuned to the same frequency as the plate circuit of D, which is connected to the input terminals of detector D-1, whose output circuit includes a circuit selective of the second even harmonic of the carrier frequency. Current of the harmonic frequency selected by the output circuit of D-1 is transferred to a similarly tuned input circuit of D-2, by the transformer interconnecting them and is impressed across the input circuit of this third detector.

As herein indicated this may be a detector or other stages of detection may be introduced, in which event a similar circuit to the input circuit of D-2 will be connected across the input of a succeeding detector and its output circuit will include a resonant circuit tuned to a harmonic of the frequency of the input circuit of D-2. Finally, a selective circuit tuned to the same frequency as that included in the output circuit of the detector which precedes the last detector shown will be included in the input circuit of the last detector, the output current of which will be impressed across the signal indicating device shown in the diagram as a telephone receiver.

Heating current for the filaments of the detecting tubes may be supplied from a single source or a separate battery for this purpose may be associated with each filament. In like manner plate current for the tubes may be provided from a single source or a separate battery may be associated with each tube output circuit as herein shown.

In either case, retard coils and blocking condensers should be inserted in the output circuits of the tubes to prevent short-circuiting of the source or sources of supply of plate current and the flow of direct current from said sources to the selective circuits associated with them. The blocking condensers are designed to permit the flow of the variable currents to said tuned circuits while preventing the flow of direct current thereto. In this, as well as in the following figures, a condenser may be used in shunt to the receiver for the purpose of by-passing any high frequency current, that is, any current of carrier or like frequency which may be present in the receiver circuit.

It may be stated that multiple detection is more selective than single detection and for large frequency differences between the current transmitted by the station whose waves it is desired to receive and the interfering station, a large number of stages of detection is more selective than a lesser number, or apparently than the heterodyne intermediate frequency method; but for a small frequency difference a large number of stages is less selective than a small number.

Duplex Radio Transmitting System

THEODORE R. BUNTING has recently described a radio transmitting system which provides electric circuits that will permit two messages to be transmitted simultaneously and independently by one antenna. This is accomplished by causing two oscillating currents of different frequencies to flow between the antenna and ground systems without interference with each other.

Two parallel radiant circuits consisting of the same antenna and ground are used, and between them are two electrical circuits each of which includes a tuning inductance and an impedance circuit composed of an inductance shunted by a capacity, each impedance circuit being tuned to the frequency of the opposite radiating circuit. The two radiating circuits are tuned to oscillate at frequencies sufficiently different to render negligible the impedance of each impedance circuit to the oscillating current of the radiating circuit of which it is a part. These parallel radiating circuits, combined with means to compensate each impedance circuit for any change in the value of the electrical constants of its correspondingly opposite radiating circuit can be used in a duplex radiating system with undamped or continuous waves, the frequency of which is modified to accomplish signaling.

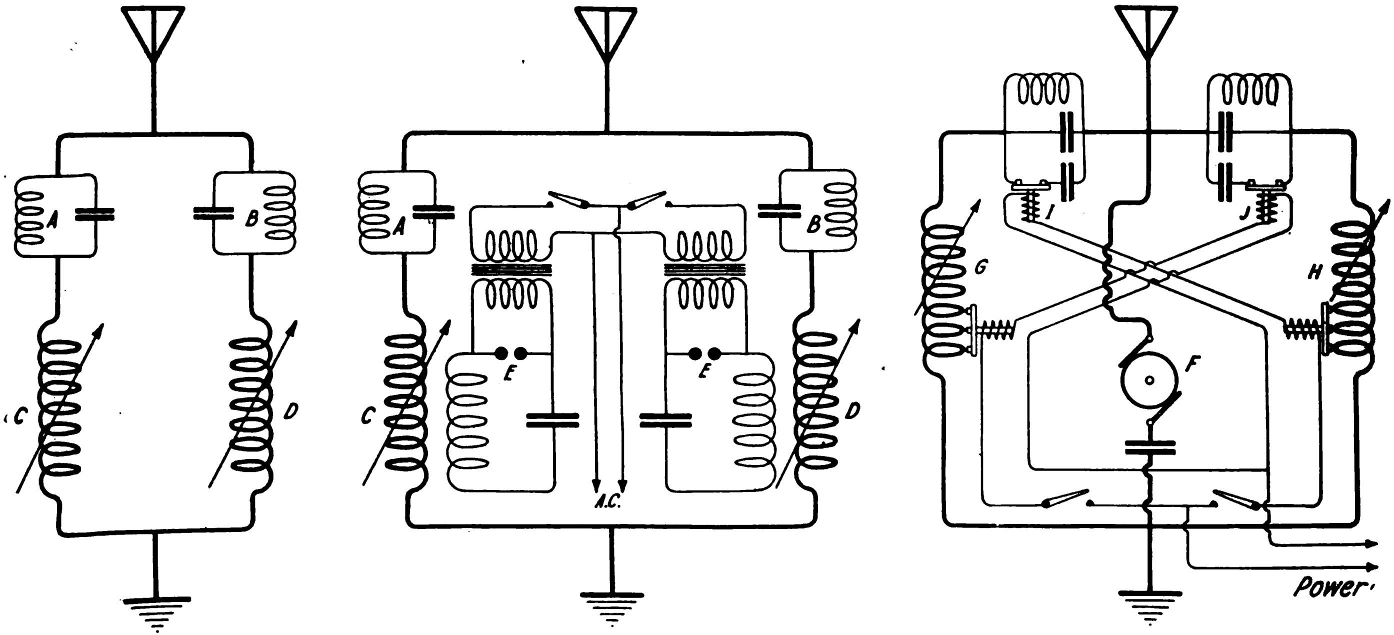


Figure 1 Figure 2 Figure 3

Wiring diagram of the system of duplex transmission on a single aerial and ground

In the accompanying drawings, figure 1 shows diagrammatically a radiating antenna circuit for duplex radio transmission. Figure 2 shows the same combined with two oscillating circuits having the same or different sources of power, but generating different high frequencies. Figure 3 shows diagrammatically a duplex radio transmitting system using continuous waves, with means for altering the values of the constants of the two radiating circuits independently, and simultaneously compensating for such alterations.

Referring to the drawings A and B are the impedance circuits, and C and D tuning inductances, said impedance circuits and tuning inductances being inserted in the branches of the antenna-earth circuit.

In figure 2 oscillating circuits are shown each comprising a primary inductance, a condenser, a spark gap, E; a transformer or telegraph keys, and a common source of alternating electric energy, though the system contemplates the use of either a common or different sources of alternating electrical energy.

The operation of the system is as follows: When the operator closes one of the keys, the AC energy is transformed to the secondary winding, whence it is converted into high-frequency oscillating currents in the circuit including capacity, inductance and spark gap, the electrical constants of which are of such value as to make these oscillations of the same frequency as the radiating circuit to which it is coupled by the primary and tuning inductance C. The presence of the impedance circuit B prevents the oscillations of the radiating circuit from being interfered with by the presence and electrical condition of the opposite radiating circuit. The arrangement, however, contemplates any method for generating damped oscillating currents whereby damped oscillating currents of different frequencies are independently caused to flow in the duplex radiating system.

Referring to figure 3, a generator of high frequency continuous or undamped oscillations F is connected in series with a capacity between the antenna and earth. A source of electric energy is connected through the telegraph keys to the electromagnetic contact closers G, H, I, J, which control the value of the tuning inductances and the use or non-use of the additional capacities, which are included in the impedance circuits. Any device electrical or mechanical, may be used to control the value of either the inductance or the capacity of the impedance circuit simultaneously with the change in the tuning inductance of the opposite radiating circuit, so that the frequency of said impedance circuit shall be maintained coincident with the frequency of the wave radiated by the opposite radiating circuit.

The operation of the system described in figure 3 is as follows: Continuous oscillations of two different frequencies are normally flowing in the duplex radiating system, and signaling is accomplished by independently modifying the frequencies of the radiated

(Continued on page 79)

Oscillation Generator of Constant Frequency

A MEANS for generating oscillations, the intensity of which is independent of small changes in the impedance between the output electrodes of the evacuated vessel, so that approximately similar evacuated vessels may be used in the oscillation generator without producing any change in the high frequency output has been developed by Edward O. Scriven.

It is well known in the art that a vacuum tube repeater of the vacuum tube type may be made to oscillate by providing a feed-back connection from the output to the input circuit of the device, and by providing a condenser suitably placed in the tube circuits for tuning to the desired frequency. One type of such a generator is described by Hartley for oscillation generators. The output, however, from such a generator is not constant for a given setting of the condenser and the feed-back connection, but depends upon the electrical values of the other elements of the oscillator, such as the impedance of the vacuum tube and the voltage of the direct current source.

For the accomplishment of this object a path of high impedance is embodied in the output circuit of an oscillating tube for the direct current from the source of voltage for the output circuit, and a path of low impedance for the resultant oscillations. The path of high impedance, preferably composed chiefly of a resistance, should be of such a value that the space current remains practically constant irrespective of the condition of oscillations, and of slight changes of the output voltage source or of the impedance between the output electrodes of the evacuated tube. If the direct current remains constant, it follows, therefore, that the alternating current developed will have the same constancy. If, now, a circuit of low impedance, preferably composed chiefly of a resistance, is provided for this alternating current, which impedance is not changed by change of frequency, an alternating voltage of constant amplitude may be obtained from this impedance which may be impressed on suitable receiving or transmitting terminals, such as the input circuit of an amplifier, or the terminals of an outgoing line.

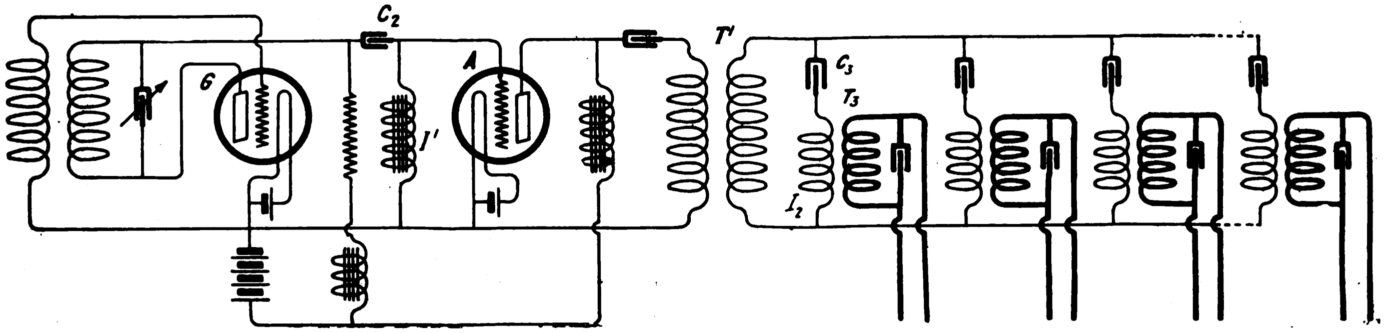


Figure 2—Circuit diagram of the harmonic generator

It has also been found that, due to this constancy in the space current, the frequency generated by the oscillator for a given setting of the condenser also possesses the same constancy and is made practically independent of small fluctuations in the voltage or the electrical values of other elements in the circuit.

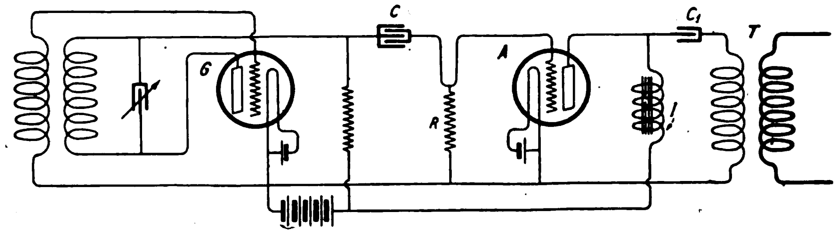


Fig. 1. Constant output oscillation generator

The output, however, from such a generator is not pure, as high harmonics are present in addition to the fundamental oscillation. It is possible to increase the intensity of the harmonics from such a generator to such an extent that they may be comparable in intensity to the fundamental. This may be accomplished by providing for the high frequency oscillations of the generator, a path, the impedance of which increases with increase of frequency. The drop of potential across this impedance may then be impressed upon suitably tuned circuits, so that the various harmonics and the fundamental may be separated from each other.

By the two arrangements described vacuum tubes of approximately similar characteristics may be employed in connection with a given tuned circuit to generate oscillations which will be constant in intensity and frequency for all the tubes. Such a constancy is of especially great importance when the generator is associated with a system containing tuned circuits, for, on substituting one tube for another, no change need be made in the tuning of the circuits, since the frequency will remain the same.

For the better understanding of this circuit, reference is made to the accompanying diagrams, in which figure 1 represents an embodiment of this design from which a constant output may be derived, and figure 2 represents an embodiment which may be employed as a harmonic generator. Each vacuum tube in the drawings has a reference character beside it to indicate its function. Thus, "A" indicates that the vacuum tube is an amplifier, and "G" indicates that the tube is an oscillation generator.

In figure 1 the oscillation generator, taken in connection with inductance coils and shunted capacity, constitutes an oscillator which generates oscillations of a frequency determined largely by the tuning of the closed circuit including the inductance and capacity. The source of voltage for said generator, has its negative pole connected to the filament and its positive pole connected through the high resistance to the anode or plate. This resistance is of such a high value that the direct current flowing through it is practically constant and less dependent on the frequency of oscillation or of slight changes in the impedance between the output electrodes or other elements of the vacuum tube circuit. A path of low impedance for the oscillating currents between the anode and the filament is provided by means of the condenser C and the resistance R. The condenser C, has preferably a large capacity, and has consequently small impedance, so that most of the impedance of this path is due to the small resistance of R. The impedance of this resistance is independent of the frequency of the oscillations generated, and therefore, since the space current remains constant, the amplitude of the alternating voltage across the terminals of this resistance is constant; and this voltage drop may be employed, as shown, to impress the generated oscillations upon the input circuit of the amplifier A. The amplifier oscillations in the output circuit of A may, by transformer T, be impressed upon any suitable receiving or transmitting terminals. The amount of voltage impressed on the amplifier may be regulated by means of the adjustable contact X. This amplifier A, has the peculiar characteristic that it will allow current to flow through it in one direction only. Consequently, although it functions to amplify the oscillations from the generator G, and to impress them upon the outgoing circuit of T, it will not allow current to flow in the opposite direction, that is, from the outgoing circuit back to the oscillator. The outgoing circuit, therefore, cannot react upon the oscillator to produce distortions in the wave form of the oscillations generated due to fluctuations or changes of the load in said circuit.

Condenser C is inserted to prevent the direct current from passing through the side circuit containing the small resistance R. The source of plate voltage may be also used as the output battery for the amplifier A. A choke coil I, is preferably inserted to prevent the oscillation currents from passing through the battery-circuit. Similarly, a condenser C^1 prevents the direct current from flowing through the primary winding of the transformer T.

In figure 2, similar to figure 1, there is an oscillation generator comprising a vacuum tube, the feed-back connection between the inductance coils; and the shunted capacity, and across the output terminals of the vessel is connected the high resistance and the source of voltage. A path for the high frequency oscillations is provided by the shunt, comprising the inductance and capacity C^2, connected across said resistance and source of voltage. The drop of potential across the terminals of inductance I^1 is impressed on the input circuit of the unilateral device A, which is inserted to prevent any reaction of the outgoing circuit upon the oscillation generator. The amplified oscillations in the output circuit of A are impressed, by transformer T^1, upon a system of tuned circuits. Since the impedance of the inductance I^1 increases with increase in frequency, it follows that the harmonics generated by the oscillating tube G are emphasized considerably more than the fundamental, so that the secondary of T^1 contains the fundamental oscillation and its harmonics in approximately the same order of intensity. If now the capacity C^3 and inductance I^2 are of such values that only oscillations of the fundamental frequency may pass through, then the circuit tuned to the impressed frequency will receive oscillations of only this frequency by the transformer T^3. If the next succeeding capacity and inductance are tuned to the first harmonic, then this tuned circuit will receive oscillations of only the frequency of that harmonic. Similarly the next tuned circuit may be made to receive oscillations of only the frequency of the second harmonic and so on for other circuits tuned to the higher harmonics. The device, therefore, serves as a harmonic generator, and the harmonics derived therefrom may be employed for any purpose desired, such as serving as carrier wave oscillations for low frequency signals in a system for communication.

Radio at Shriners' Convention, San Francisco

THE official inauguration of the biggest and most complete radio event ever attempted on the Pacific Coast was effected at 3 P. M. Monday, June 12, when George Filmer, general chairman of the 1922 Shriners' convention, formally set in motion the wheels of the show that was held in connection with the convention.

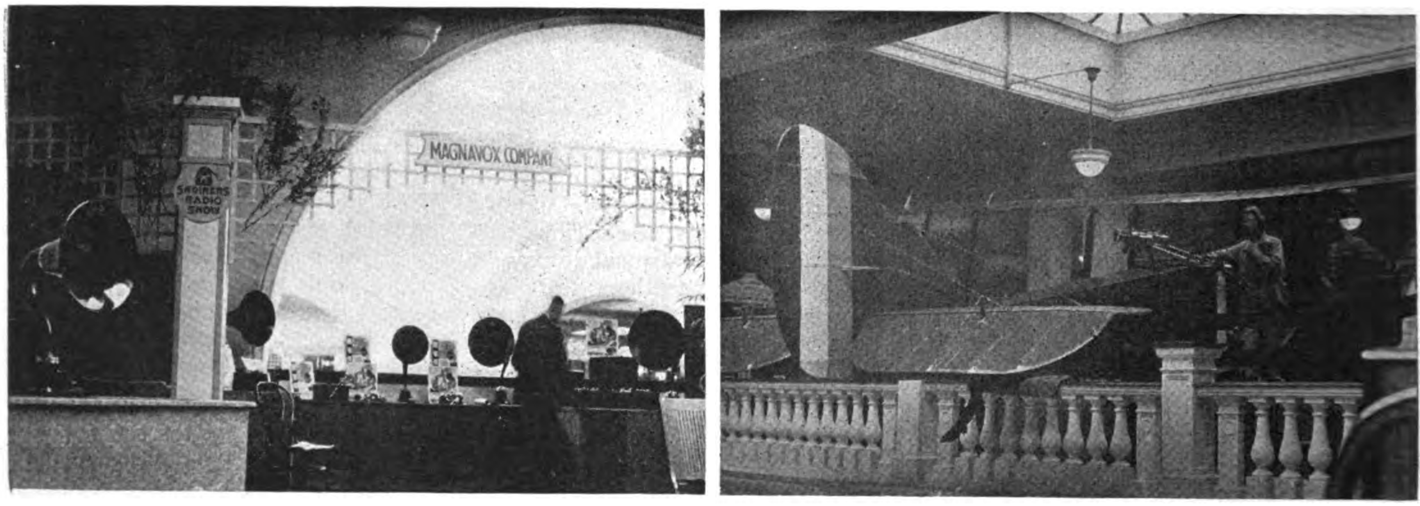
Approximately fifty exhibitors had concession booths on the exposition ground, which is located on the third floor of the Emporium, one of the large department stores in San Francisco. The booths were individual in design and were finished in decorations emblematic of the Shrine. They were constructed around the bannister of the dome and were so located that they were visible from the main floor of the Emporium.

The products shown to the public embodied everything in the radio line. Among the exhibits which interested the radio fans generally were the radio compass, designed by Dr. Frederick A. Kolster of Palo Alto, which was exhibited by the Federal Telegraph Company; the Government display booth in charge of Major J. F. Dillon, United States Radio Inspector for the Sixth District and the radio-equipped scout airplane which was exhibited by the Army Service.

The scout plane, with capacity for two passengers, was suspended in the center of the dome of the Emporium. Receiving and transmitting radio apparatus in the machine was kept in operation continuously.

As an added attraction to the radio exposition, a continuous vaudeville show and four moving pictures were given throughout the week. Two of the films were along radio lines and two showed the points of interest in California. All of this entertainment was free to the Shriners and the public.

The Emporium's five radio contests, which were run in conjunction with the Shriners' radio show, furnished much entertainment for radio fans. Silver cups were awarded the winners of the five classes. Both men and women were entered in the contests which included one for code-speed reception.

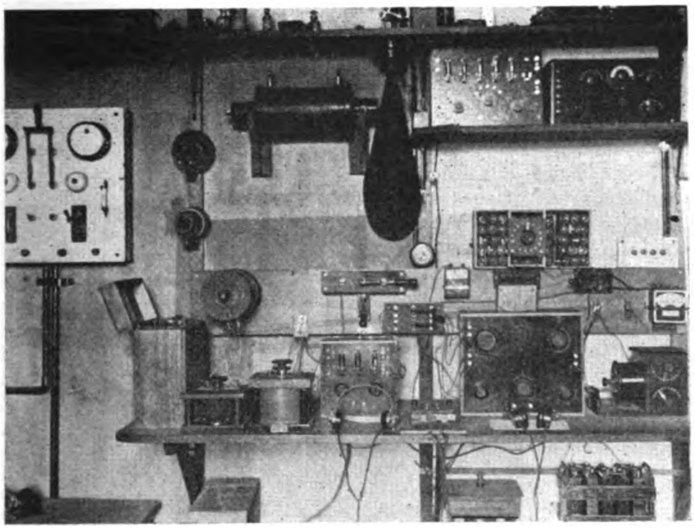


Two views in the Shriners' Radio Show. At the left, the Magnavox booth; right, radio-equipped scout plane suspended from center dome

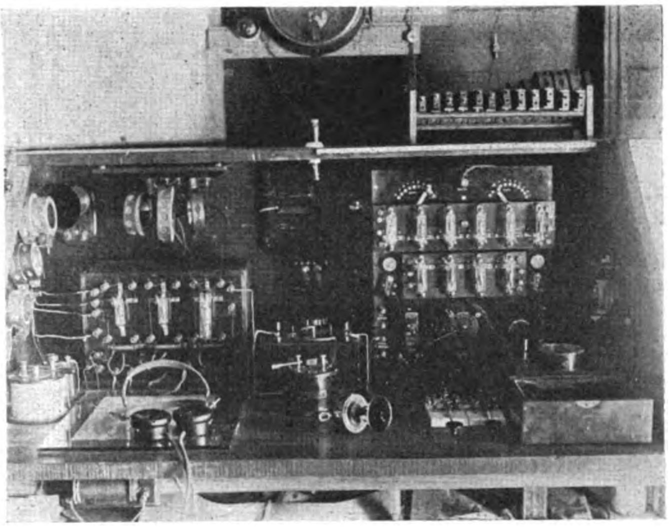
Amateur Activities in Australia

By J. S. Kemp

THE field of the amateur operator in Australia at present is very limited, being confined to reception only. To the general run of amateurs, transmission is strictly forbidden. Transmitting licenses are issued only to individuals and organizations, who can show good reason for holding them. If an amateur desires to carry out transmitting experiments he must obtain special permission from the Radio Inspector for a limited period. Our energies must, therefore, be directed to the development of the receiving apparatus. Being so restricted makes us a little envious of the privileges allowed American amateurs.



F. Leverrier's station, Sydney, Australia, equipped with resistance-coupled frequency amplifiers



Amateur station of C. D. Macluran, equipped with a ten-tube transmitter and three-tube receiver

In each of our Capital Cities we have established a Wireless Institute to promote and guard our interests generally. At various times during the year lectures on matters dealing with wireless telegraphy are given by responsible persons, and also a series of outings are arranged to various ships, and other places of interest to amateurs. Recently with the permission of the Radio Inspector, a competition in receiving C. W. Tonic Train, and Telephony, was held under the auspices of the N. S. W. Division of the Wireless Institute of Australia. Each competitor was provided with a special set of log sheets, and schedule containing particulars as to prizes, rules, order of the transmission, etc. The signals were transmitted on a wavelength of 1,400 meters from Mr. Maclurcan's station at Strathfield, Sydney.

The results of the competition were on a whole very satisfactory, excellent work being done by the various competitors. This competition was the first of its kind ever held in Australia, and it is hoped will be the forerunner of many more, doing much to foster the spirit of enthusiasm and interest amongst amateurs generally. In my own locality there are about a dozen amateurs within a radius of a mile, also a radio club with a roll of about thirty members. This club possesses a transmitting and receiving license but owing to restrictions transmission has not been carried on. Nearly all these stations are fitted with the latest receiving appliances, and it is possible, using only one valve, to receive many American high power stations easily. A couple of stages of amplification increases signal strength to such an extent that signals are read a fair distance from the phones. The photographs of two amateur stations in operation in my locality are included with this article. The transmitting and receiving set belonging to Mr. C. D. Maclurcan, and the receiving set only, to Mr. F. Leverrier. Mr. Maclurcan's station consists of a tube transmitter and a three-tube receiver.

The transmitter is shown to the right of the photo and consists of ten Marconi V24 tubes, five of which are used as oscillators and five as modulators, connected on the "shunt" or "Heising" system. The high-tension voltage is supplied by a small 600-volt generator, driven by a quarter horsepower induction motor. The filament current is supplied by means of a step down, transformer from 240-volt A. C. mains. By manipulating various switches on the panel it is possible to use the set either as a radiophone, C. W. or buzzer modulated transmitter, and transmit on all wavelngths up to 1,400 meters. Excellent results have been obtained with this set, signals being heard in Melbourne, a distance of 400 to 600 miles, using only ten watts power.

The receiving set consists of three tubes, two Marconi V24's, and a Roome tube, transformer, coupled, mounted on a small cabinet shown in the left portion of the photo. A novel feature of this set is the filament resistances, combining as they do, a switch and resistance, and are shown mounted in a horizontal position, just under the tubes, enabling each filament to be regulated or switched off. Honeycomb coils of his own manufacture, a specially constructed primary condenser, giving a very fine variation of capacity, Baldwin phones, and the usual run of tuning condensers complete this set. By means of a wavelength chart, shown mounted under a glass cover on the desk, tuning is very quickly accomplished. With this apparatus it is possible to cover all wavelengths from 300 to 25,000 meters, Nauen, Lafayette, Lyons, New Brunswick, and many other high power stations being received with fair signal strength. This station is also fitted with a heterodyne wavemeter calibrated up to 22,000 meters, which can be used either as a transmitter of damped, or undamped waves, or as a receiver, or crystal wavemeter. Used as an independent oscillator in conjunction with the Roome tube, splendid results are obtained. An experimental loop, two aerials, and a counterpoise ground complete the station.

Mr. Leverrier's station consists of three Marconi V24 tubes, composing a radio-frequency amplifier, resistance-coupled with electrostatic feed back from the second tube; the tubes, condenser and filament resistances, being mounted on a small cabinet, as shown in the left portion of the photo. A Telefunken condenser, honeycomb coils of his own manufacture, covering all wavelengths up to 25,000 meters, and Baldwin phones complete the long wave set. The signals of many high power stations are received with this set, including those of Nauen, New Brunswick, Pearl Harbor, and numerous others. By means of a four-pole, double-throw switch, he is enabled to change over B battery, A battery, aerial and phones to a short-wave set, shown at the right of the photo. The Armstrong double-feed-back hook-up is used in this set with splendid results, the approximate receiving range being about 2,000 to 3,000 miles. With this set it is possible to receive Cavite, P. I., on long wave, very plainly, signals being heard all over the room. All local stations are received, including VIB, VLW, VLA, VIA, and many others.

The instrument shown to the extreme left of the photo is a heterodyne wave meter, built from the specifications of Mr. R. W. Goddard, January, 1920 issue of The Wireless Age with a few modifications. This instrument is calibrated up to 15,000 meters. A recent valuable addition to this station consists of a Brown loud speaker, which has given excellent results, signals being tremendously amplified. At the time of writing a cabinet is under construction, consisting of one detector tube, and five amplifying tubes, resistance-coupled, for long wave work, and it is most likely that this set will bring in all the high power stations of the world with readable signal strength.

These stations are fair examples of the scope of amateur work in Australia. As to radiophone experiments very little or none at all are being carried out by the general run of amateurs. The Amalgamated Wireless, of Sydney and Melbourne, using a ½ kilowatt set, send out concerts occasionally. Regarding hook-ups and designs, each style has its devotees, some favoring the isolated type, others the cabinet sets. I will say in conclusion that owing to some unscrupulous individuals who persistently interfere with commercial traffic we are in constant danger of losing our receiving licenses. But we hope as our numbers increase, that we will be able to exercise a system of control similar to that in vogue in America, to eradicate this evil. Therefore we live in hopes of the day when the ban will be lifted and we can experiment freely once more with transmitters.

Amateur Wireless in England

By Frederic L. Hogg

As a regular reader of The Wireless Age, not having seen many details of what we are doing over here, it occurred to me that the amateurs of America might like to know and perhaps try some of our circuits.

The amateur wireless community, although increasing monthly, is still very small in numbers as compared with our cousins in the States: we only number 6,986, of whom 286 hold transmitting licenses. Of the recent and successful trans-Atlantic tests I will not say much, as I know they have already been fully covered.

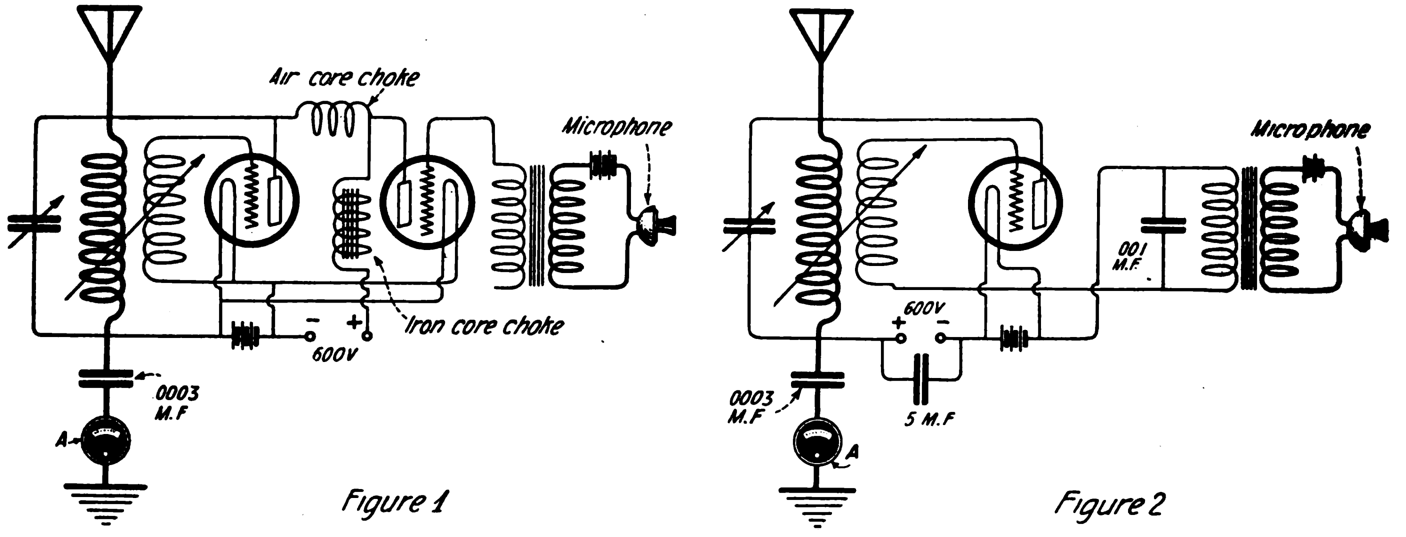


Figure 1

Figure 2

CW transmitting circuits that are popular in England

Being so cramped for space here, we are handicapped in many ways, especially so in London, where a good aerial is very rare, and the usual earth is the waterpipe, surrounded, as we are by buildings and a maze of telegraph wires. Again we are limited to 10 watts input. So we try to get the best results under very adverse conditions.

The wavelengths for transmission, we are permitted, are 180,440 meters, and occasionally 1,000 meters. As 1,000 meters is rather close to 900, which all the Government and Air Force telephony stations use, a certain amount of jamming has been reported lately from amateurs on 900 meters. There is practically no spark transmission done, it is almost entirely confined to C.W. and radiophone.

For telephony transmission the most popular circuit is undoubtedly the choke control system, this, although tending to distort the speech very slightly, is eminently reliable and suited to the longer wavelengths which we nearly all use. The circuit is generally a modification of figure 1. The high tension supply is as a rule derived from a 600-volt D.C. generator, although some stations use rectified A.C. with considerable success, but this requires a lot of smoothing out to get rid of the hum usually noticed when A.C. is employed. The antenna current is as a rule in the neighborhood of half an ampere.

The one disadvantage to this circuit is the two extra chokes required; so grid modulation is sometimes employed, but this as a rule is not so efficient, this method also does away with the extra control valve, as in figure 2. The usual tube employed is the B type, which is very similar to the French R tube used for reception over here, but is much harder, and the grid is wound finer, other transmission tubes in use are the 0.20. and the A.T. 25, but these are intended for higher power up to 50 watts; although they all fit the standard four pin socket in use here.

Radiophone concerts are very popular round London, in fact unkind people say too much so, and now we are limited to a 15 minutes' transmission, then listen in for 15 minutes before transmitting again. In fact there are very few evenings when you can't pick up the phones any time between 8 and 10 P.M. and hear several concerts going on, the usual conversation and testing.

Naturally after the war there was any amount of British, French and even German wireless apparatus sold by the Government at knockout prices, and many an amateur station is largely composed of it. Parts of the well-known Mark 3 Tuner are to be seen everywhere; this was simply a two-circuit crystal receiver in a portable case, and contained among other things two very good tuning condensers which could be taken out, and sold for about 20 shillings. Apart from this ex-government gear, prices are on the whole much lower over here.

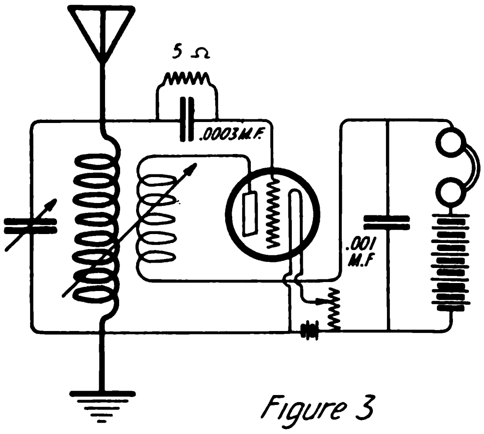


Figure 3

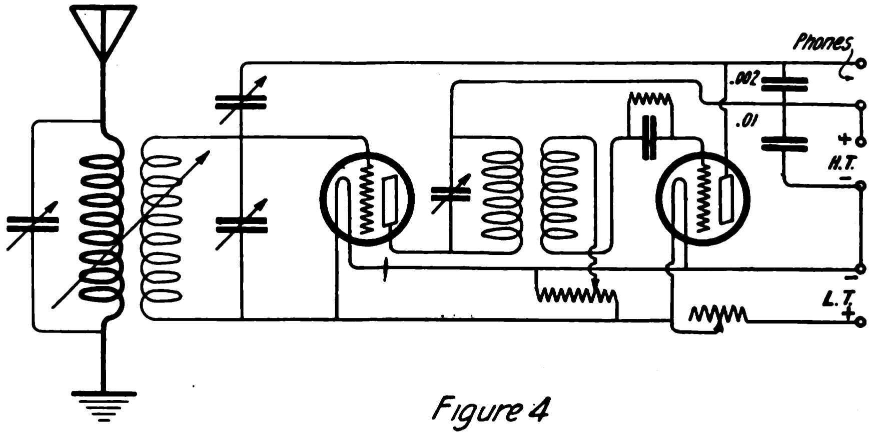


Figure 4

One and two tube English receivers, the latter using a tuned transformer

Besides amateur radiophone stations, there is plenty of telephony to listen to. All the airplane stations and airplanes on the London-Paris route are equipped with radiophones and can be heard daily. There are also other big commercial stations which use telephony, the Eiffel Tower and The Hague, which transmits the famous Dutch concert that everybody tries to "tune in." Many fail, however, as the power used is very small, only about 200-250 watts and the distance is nearly 400 miles, so it is extremely difficult to receive the station without high frequency amplification. Other stations are Berlin (POZ), and Chelmsford, the station belonging to the Marconi Co. All four give very good concerts and from the Eiffel Tower (Paris) we often hear famous singers from the Paris Opera.

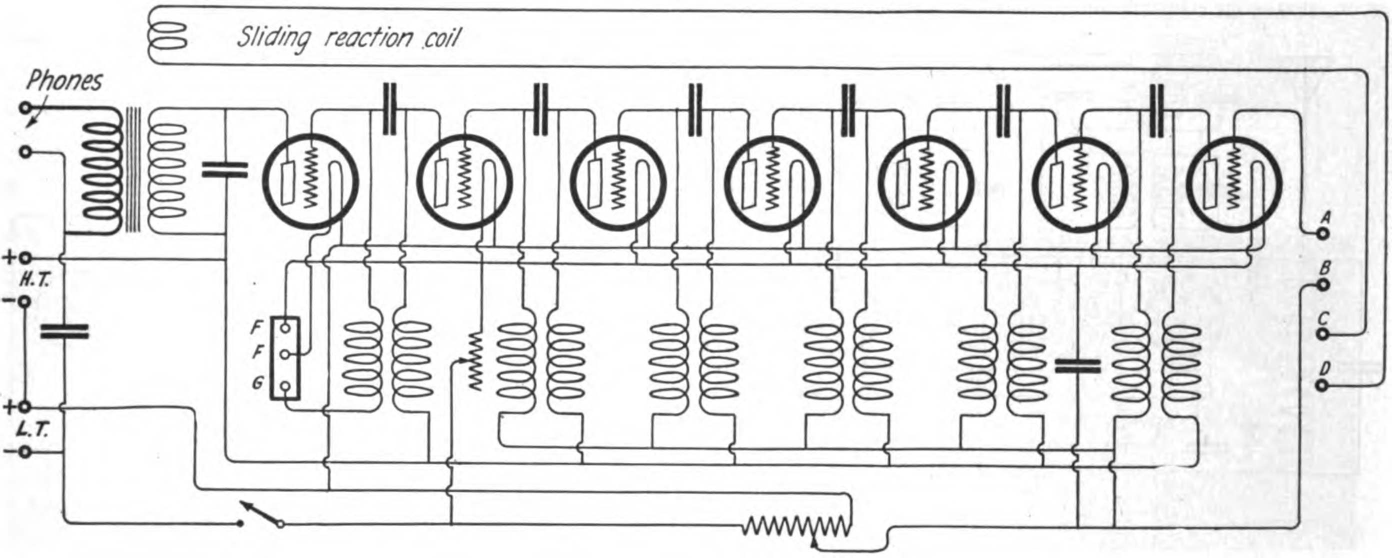


Fig. 5. Seven-tube amplifier especially suited for long-wave trans-Atlantic reception

For reception there are several chief circuits in use, though very few stations employ the Armstrong regenerative circuit, so common in America. The single tube circuit used here by some of the smaller stations is given in figure 3. It embodies the reaction principle, and rectification is brought about by means of a leaky grid condenser. This is the standard tube receiver on which we all graduate until we want something better and go in for high frequency amplification. For low frequency amplification the usual circuit is employed. By the way, a sure cure for a noisy low frequency amplifier is a small condenser about .0007 placed across the secondary transformer after the rectifying valve. The hissing noise often met with in a low frequency amplifier is a strong oscillation just above the audibility point, and the condenser cuts it entirely out.

For high frequency amplification there are several circuits in common use. 1, tuned interchangeable transformer; 2, periodic transformer; 3, Round 16-circuit, tuned anode or auto-transformer; 4 resistance-capacity coupling.

All four circuits have their weak points, the ideal high frequency amplifier for amateur use to cover all wavelengths still remains to be found.

The tuned transformer of figure 4 is a 1-1 air core, wound with 44 S.W.G. copper wire, tuned to the wavelength of the incoming signal by a variable condenser in shunt across the primary and electrostatic reaction is employed. The disadvantage of this amplifier is that about eight different transformers for each tube are required to cover the entire range of wavelengths from 200-25,000 meters. These transformers are usually fitted with four pins to plug into the standard valve holder we use.

The aperiodic transformers of figure 5 are 1-1 air core, but are wound with resistance wire 45 S.W.G. Eureka, and have a resistance of about 24,000 ohms, these transformers instead of giving an optimum on one particular wavelength, maintain a fair efficiency between 1,500-25,000 meters. This is a fair range, but separate transformers are needed for wavelengths from 200-1,500 meters. A seven-valve amplifier on this principle is used in all commercial stations for trans-Atlantic reception, on wavelengths between 8,000-17,000, but this amplifier for the amateur is expensive and will not give good amplification on the shorter wavelengths.

The tuned anode circuit of figure 6, for amplification of weak and distant stations, is far and away the best, but is troublesome to tune over a large range of wavelengths, as the anode circuits have to be accurately tuned to the wavelength of the aerial. The set will only oscillate when they are in tune. When properly tuned to a definite wavelength, however, it is capable of giving marvelous results, and is very free from jamming as it only oscillates on the wavelength to which it is tuned. I personally tuned up an eight-stage amplifier on that circuit for the first trans-Atlantic tests. Each succeeding anode circuit has to be tuned up with a wavemeter to the required wavelength, which was in that case 200 meters. Last comes resistance-capacity coupled amplifiers, as shown in figure 7.

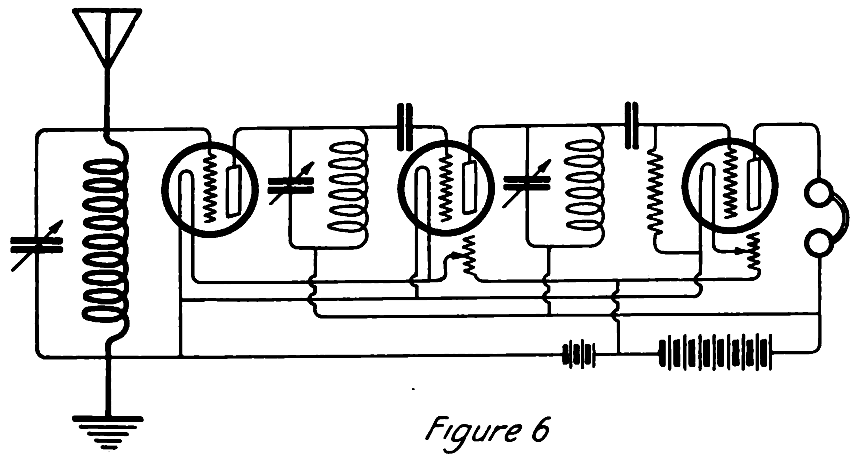


Figure 6

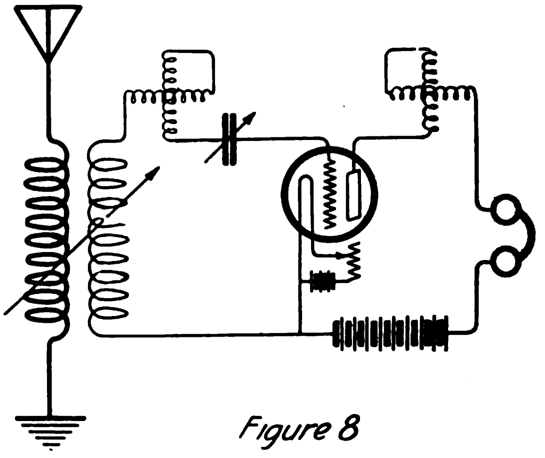


Figure 8

Tuned anode circuit and an effective single-tube short-wave receiver

This again employs electrostatic reaction; its chief merit lies in the fact of its cheapness, the coupling between the tubes consists of one condenser and two resistances as against the usual transformer. But it has several drawbacks; first, that it will not operate below 1,500 meters, due to the interelectrode capacity of the tubes at that very high frequency, which at 300 meters is 1,000,000 a second. The impedance of a condenser to alternating current varies indirectly as the square of the frequency, so the high frequency impulses of the low wavelengths pass the coupling condensers very easily, and so lower the amplification. Also, its amplification seems to drop after about 15,000 meters, and at its best the amplification per tube is poor compared to high frequency transformer-coupled amplifiers. It requires about six tubes of resistance-coupled amplification to give the strength of signal that four transformer-coupled will. I believe, however, that an amplifier of this kind which overcomes all these bad points will shortly be on the market, and when it is it will certainly be the best amplifier for amateurs because of its flexibility and cheapness, as compared to other types of high frequency amplifiers.

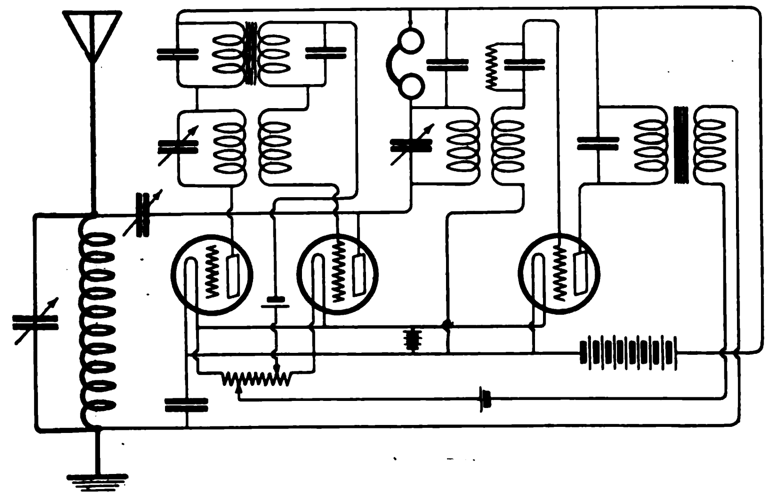


Figure 9

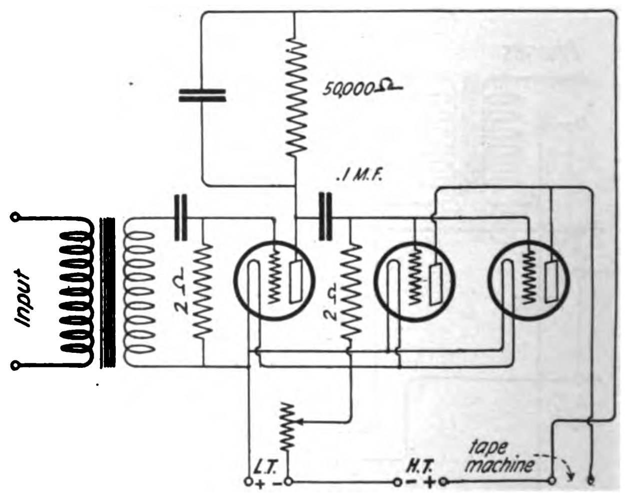


Figure 10

Heterodyning and tape recorder circuits

One thing that strikes me very forcibly on looking through The Wireless Age, is the great use made of variometers for fine tuning, while we, as a whole, use variable condensers; I, myself, prefer the variometer. It is cheaper and more efficient. In fact, one of the finest single tube circuits I ever used contains them. It is given in figure 8 for what it is worth, and I can thoroughly recommend it.

There are all sorts of tuners in use over here, but the single layer coil for longer wavelengths is gradually being displaced, and we are following the example you set us, of using honeycomb and duolateral. One very efficient coil which, owing to the trouble of winding is not very much used, is the eight bank pile winding, this is as good as anything, for long wavelengths and also has the additional advantage of compactness, a 20,000 meter coil wound on this principle can be got on a tube three inches diameter and about four inches long, it can be tapped for the shorter wavelengths.

The advantages of an independent heterodyne are not sufficiently realized over here, the autodyne method of reaction is preferred owing, no doubt, to its greater simplicity. But the heterodyne method, besides preventing any radiation from the receiving aerial, increases signal strength considerably, especially on wavelengths over 10,000 meters. For instance, on 18,000 meters, employing an autodyne receiver, in order to get the beat note, the receiver must be mistuned nearly 1,000 meters, that is over 5 per cent mistune. With a heterodyne the signal strength would be doubled or more, as well as helping to eliminate jamming. To give an example, using a standard seven-tube amplifier and autodyne reaction, Marion (WSO) can be heard in London with the phones on the table at night time. On the same apparatus, but employing an independent heterodyne, WSO is audible thirty feet from the phones.

Talking of high power stations, I presume the American amateurs are familiar with the note of Carnarvon (MUU). An improved tube set, employing 56 tubes is being used. The antenna current is 350 amperes, and by increasing the power it is hoped to raise it to 1,000 amperes. This is the set that recently made the long distance record, being received in Australia, 12,000 miles.

A new circuit which has been employed with considerable success here lately is one giving simultaneous high and-low frequency amplification, figure 9. Although looking rather involved, it gives very good results and of course is advantageous in decreasing the number of tubes.

A good many amateurs have attempted the recording of wireless signals with indifferent success due chiefly to the absence of a reliable relay, sufficiently sensitive and quick acting. Various circuits have been proposed from time to time to obviate this, such as the "Turner valve relay," or a circuit based on the "Wheatstone bridge" principle. But a circuit which I used with considerable success for some time, is given in figure 10. It is a "Very low-frequency amplifier," and by putting the last two tubes in parallel it will give sufficient current to actuate polarized Morse inker direct, without any intermediate relay. Of course it must be used after at least three or four previous stages of high frequency amplification, but when once adjusted is very stable and will run for hours without attention. I believe it was first proposed by Professors Abraham and Block, of the Paris University. Of course the simplest method of recording is by the Dictaphone. This is the means employed by the Marconi Co. on the London-Paris service; the signals are recorded at 120 words a minute and translated by running the Dictaphone at a slower speed afterwards.

Another very interesting branch which is being developed here is wireless direction finding. All the airplanes on the London-Paris route are supplied with their bearings in foggy weather. But not having done much work in this line, I am not in a position to tell you about it at this time.

In conclusion, I hope to have the pleasure of writing more about our work over here at a later date. I shall be only too pleased to answer any inquiries if addressed to me, care of the Editor of THE WIRELESS AGE.

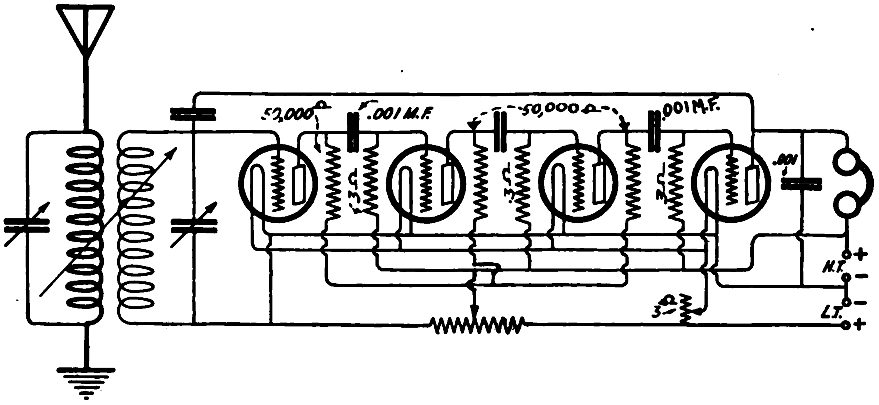


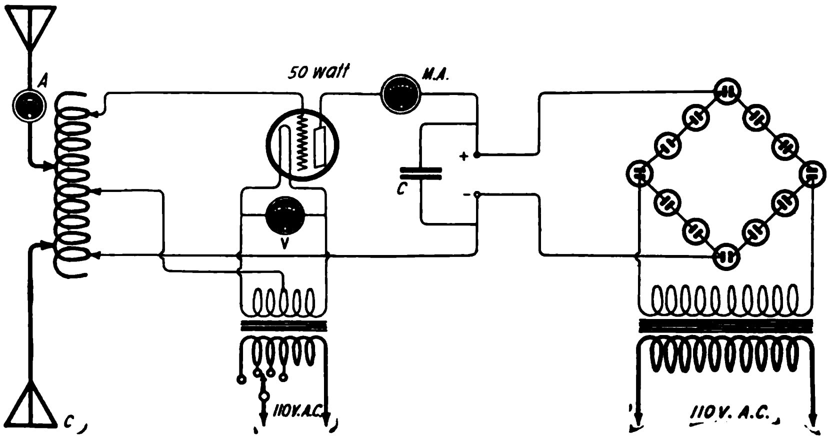
Figure 7. Resistance-capacity coupled amplifier system

Exceptional DX Work on 50 Watts

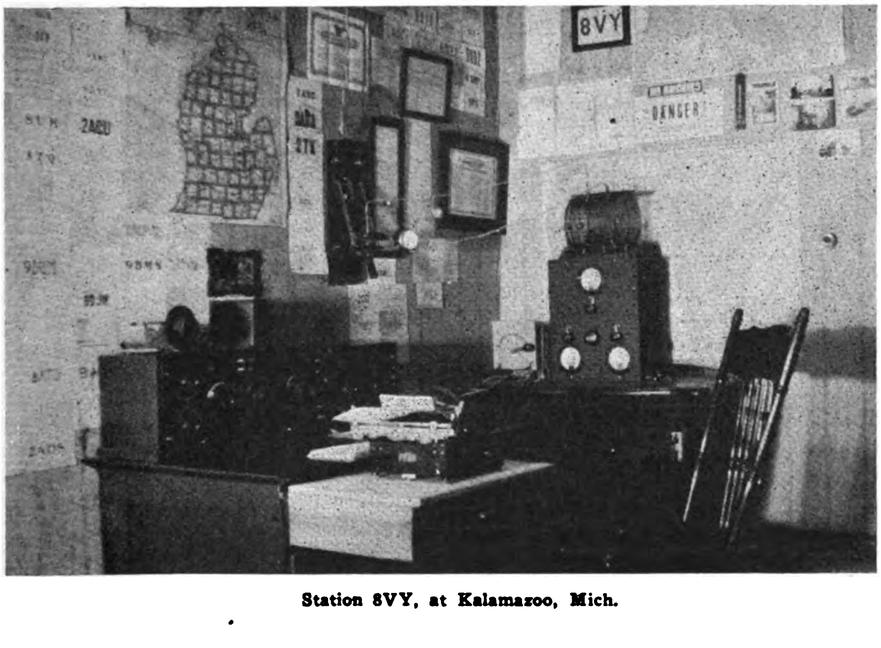
By 8VY, Kalamazoo, Mich.

AN INTERESTING transmitting set, using alternating current mains for both the filament and the plate circuit of the power tube, is installed at station 8VY, operated by F. M. Louwaert and F. N. Wright of Kalamazoo, Mich. The station, which is largely composed of home-made parts has been heard in every district, on both coasts, in Alaska, and by several ships at sea, the signals being reported loud and distinct. With a 50-watt tube, the radiation is 5 amperes.

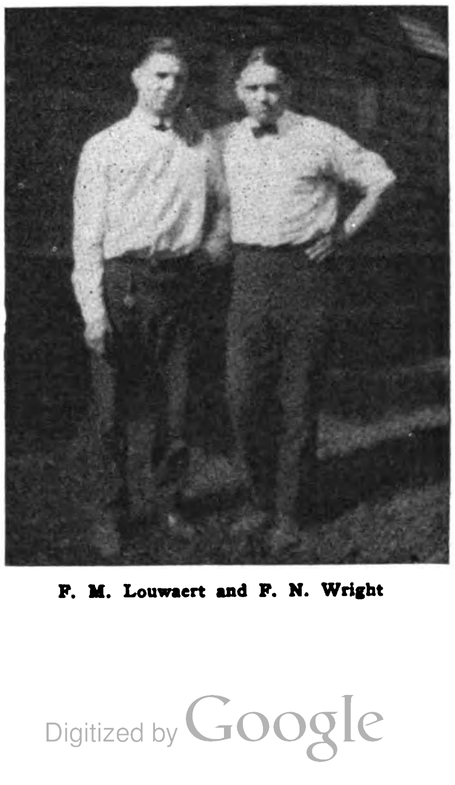
This is one of the many sets that has been going through a growing process. It started in continuous wave work with 10 watts, and was able with this small amount of power to do some interesting work, performing so well as to stimulate the imagination as to what could be done with more wattage. A



Simple transmitting circuit at 8VY using current from A. C. mains



Station 8VY, at Kalamazoo, Mich.



F. M. Louwaert and F. N. Wright

conference with F. N. Wright, 8CJU, who was also seeking additional power, resulted in a pooling of resources. The two stations joined forces, which gave 8VY its first 50-watt tube.

The circuit used is very simple, as can be seen from the diagram. Kalamazoo has 110-volt alternating current, and the expense and bother of storage batteries has been obviated by making use of this current, properly rectified. The filament of the power tube is heated through a transformer made by Louwaert and Wright themselves. This has a tapped primary to vary the voltage, taking care of the changing needs of service. In order to eliminate the hum of the alternations of the current, the secondary of the transformer is tapped at its middle point and led to the tuning inductance. A voltmeter is shunted across the filament line, and in the antenna is placed a thermo-coupled ammeter, reading up to 10 amperes.

Plate potential is supplied likewise from the 110-volt A. C. mains through a transformer, a home-made one consisting of 350 turns of Number 16 cotton and enameled wire in the primary and 3,500 turns of Number 26 wire in the secondary. The current from the secondary is passed through a rectifier consisting of 20 jars of a borax solution, containing lead and aluminum plates. A mica filter condenser is connected across the leads from this rectifier, taking out the hum of the alternating current supply. A milliammeter reading up to 500 milliamperes indicates the current in the plate circuit.

Antenna at 8VY

The antenna system consists of four wires, in a box, or cage type, and a counterpoise of eight wires held horizontally by two spreaders. This system is used for both transmitting and receiving.

This station has been heard by 6XAD, 6RR, 6ZZ, 6AOW, 6ARF, 6ARE, 7LU, 7ZS, 7TQ, 7JS, 5CN; by the S. S. *Reuce* when it was 425 miles west of Fort Stevens, Ore., in the Pacific Ocean. It also has been heard in Chignik, Alaska, and has worked with 5ZA, 5ZAK, 9XAQ, 9BJI as well as a number of others with signals reported very QSA. Since last September station 8VY has received 1,595 cards, 531 stations have been worked in all, and a large number of messages handled. The station soon is to use 100 watts, and expects to increase its radiation greatly and thereby its range and strength. The receiving set used is of the standard regenerative type, making use of the Armstrong hook-up, but spider web coils are used instead of a variocoupler.

The Broadcast Reception Problem

By Ralph R. Batcher

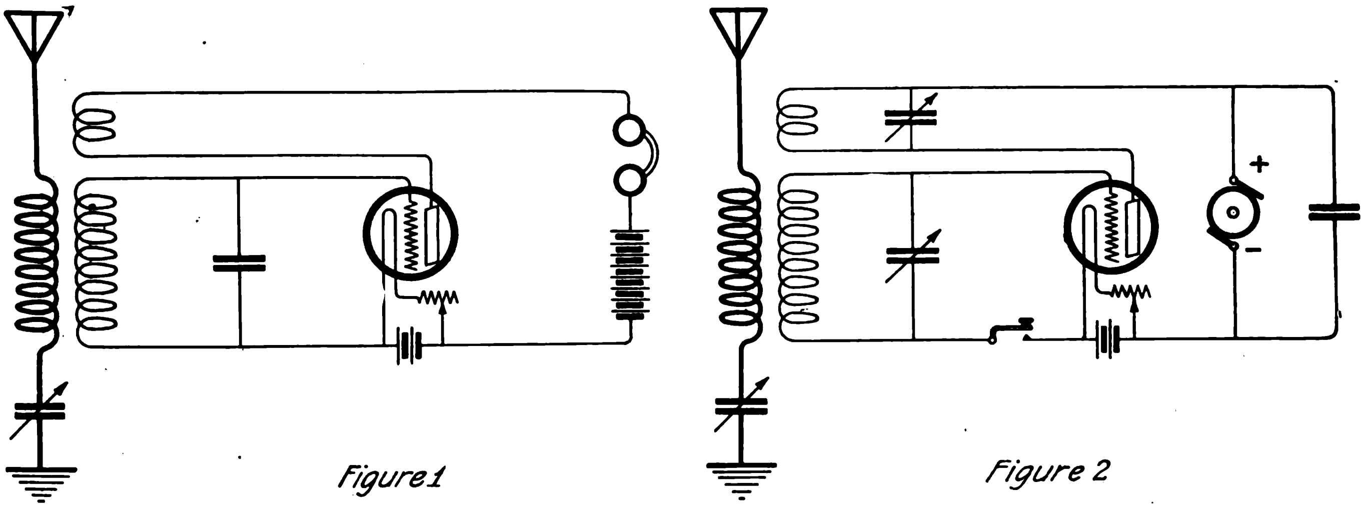
THE announcement that a prominent Long Island Hotel has decided to install 600 radiophone receivers in their hotel, one in each room, has caused many a smile from old-time amateur experimenters who have long known both the advantages and the limitations of the art.

Since the details of the scheme were not announced we can only assume what might be done and then analyze results. Since the installation of six hundred separate antenna systems on or around the building is both physically and electrically impossible such a method will not be considered here. Because of the close inter-action between the circuits very little difference would result in trying to tune one circuit, when there are 599 others being used around it, than in trying to tune the set directly coupled to one big antenna with all the others.

"Ah," some tyro will say, "use loops, one in each room. Then put in good regenerative sets, and there you are!" I tested such a proposition by questioning several radiophone listeners as well as several electrical supply dealers who advertised to solve radio problems, and was assured that there was nothing wrong with the theory. One even thought up a neat little analogy somewhat as follows: Six hundred radio antennae would absorb no more energy than 600 steel girders in the building, so there would be enough radio energy to supply that many sets at once at least, and probably many more besides.

I mentally agreed with him that there would be plenty of radio energy in the vicinity, but wondered what per cent. of it would have originated at the broadcasting station.

This brings up the problem which I would like to call attention to which is of late overlooked so many times: A regenerative receiver will always re-radiate energy, often much more than it receives. A comparison of a typical regenerative circuit (figure 1) and a common type of transmitting circuit (figure 2) will show great similarity. The difference in general is in the amount of energy supplied to the plate circuit which is less in the case of the receiving set, and the degree of coupling between the plate and grid is somewhat less. The author used this principle several years ago to communi-



Circuit diagrams showing similarity between regenerative receiver and CW transmitter cate with another experimenter several blocks away. After making certain adjustments of the tickler coil in a regenrative receiver, a message tapped out by touching the grid condenser terminal with the finger to form characters of the code could be readily picked up at the other station. Doubtless some of the distance records which are claimed with some crystal receivers are partly due to other receiving sets of a regenerative nature operating in the neighborhood, re-radiating energy.

The problem is much more difficult when using the recent Armstrong super-regenerative circuits. Here besides re-radiating energy at the incoming signal frequency there is another frequency of a super-audible order (that generated by the oscillating circuit) radiated. Thus if two experimenters are using this circuit in the same vicinity, and if each selects a slightly different frequency to use in conjunction with his circuit, an audible beat note will be heard in both sets as well as in other receiving sets within a certain range that happen to have their constants set right for such a frequency. The resulting tones when three, four or more stations try this circuit near each other can be computed, but I will leave it to persons who enjoy solving mathematical puzzles to dope this out.

Can it be that some day the number of receiving sets must be limited? or must regenerative or super-regenerative circuits be banned? In the early days of telephony it was thought that the telephone wires must be kept thirty feet apart to prevent cross-talk. Now they put hundreds of pairs of wires in a single cable, with only a comparatively thin layer of paper for insulation on each wire. This radio problem can be solved as well in short order if amateurs would do a little investigation work. Instead of sitting down and listlessly fumbling the controls during the broadcasting period, waiting to get off some real DX work, try out a few experiments along this line. By the word "amateur" I refer to the class of experimenter as found before the days of broadcasting in distinction to the present day majority of fans—broadcast listeners.

For a few pointers which may be tried first: Is the effect lessened by special arrangement of coupling coils? Will special arrangement of current limiting devices (such as the w.k. bucking crystal or valve combination) in the antenna circuit help? Will the application of one or more steps of radio frequency amplification ahead of the regenerative receiver help? What type of regeneration gives the least re-radiation? In these tests the work may be easily checked up by two amateurs living close enough together to be affected by each other's receivers. The change in the signal intensity in one station can be noticed between the intervals that the valve in the other station is regularly turned off and on according to some prearranged schedule.

Effective Radio-Frequency Amplification

By G. N. Garrison

HOW often one encounters the phrase from the pen of well-meaning but ill-informed writers that radio-frequency is far superior to audio-frequency amplification for long-distance short-wave reception "because radio-frequency steps up or amplifies a signal from a distant station a great deal more than it does the signals from near-by stations!" As a matter of actual fact it does nothing of the kind! Common sense should convince even the non-technical that the receiving set connected to an antenna has no way whatever of knowing the distance a radio wave has traveled, when once it strikes the aerial. Since the receiving set cannot distinguish between a radio wave coming from the next block and one that has traveled hundreds of miles, it is obviously an impossibility for it to amplify the one more than the other.

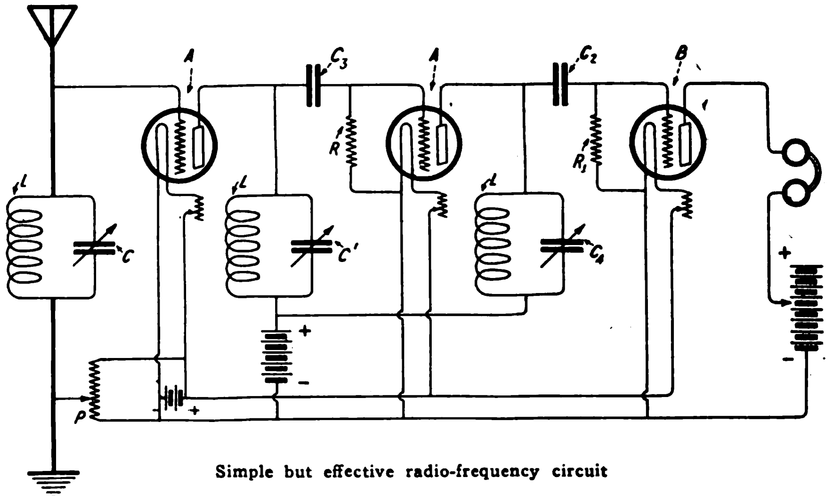
It should be pointed out that our present day vacuum tube is essentially a voltage operated device and, regardless of the type of circuit in which it is used, it will amplify only in proportion to the varying voltages applied between its grid and filament. If a relatively high voltage is applied between the grid and filament of a vacuum tube, the amount of amplification will be greater than it would be if a relatively small voltage were impressed between the grid and filament. Other conditions being equal, those signals which come from a distant station will be weaker than those from a nearby station and the varying potential which they impress between the grid and filament of our first tube—regardless of the circuit used—will be relatively small. Consequently amplification, although effected in the same proportion, will not be as great on the weak signal as it is on the strong.

Radio-frequency amplification is superior to audio-frequency amplification, not because it will "step up" weak or distant signals, but for the simple reason that it will amplify only impulses that are of radio-frequency; or, in other words, frequencies that are above audibility. Due to this fact, "A" and "B" battery noises, as well as mechanical vibration of the tubes, are almost entirely eliminated and the "squeal" which accompanies many audio-frequency amplifiers is noticeably absent. The signal, when it reaches the phones, is unaccompanied by other and foreign noises and is manifested as an easily read, exact reproduction of that transmitted by the distant station.

With the elimination of "A" and "B" battery noises as well as "squealing" of the tubes in radio-frequency amplification, it follows that by this method, considerably more stages of amplification can be used than is possible at audio-frequency, with a consequent increase in the distance covered. The writer has successfully used as high as fourteen stages of radio-frequency amplification, a detector and four stages of audio-frequency amplification and, with these nineteen tubes the small amount of foreign noises noted, were traced directly to the audio-frequency component of the circuit.

The only other claim to superiority of radio-frequency amplification lies in the fact that a circuit containing it is much more selective than one containing only a detector tube, or a detector tube with audio-frequency amplification. The sharper the set tunes, the less will be the interference from unwanted stations. This fact, accompanied by its inability to amplify other than radio-frequency impulses, accounts for the remarkable distances being covered by owners of efficient radio-frequency receiving sets.

The accompanying diagram shows a circuit which, for radio-frequency amplification, is very efficient and at the same time extremely simple. It employs tubes "A" as radio-frequency amplifiers and tube "B" as the detector. Additional steps of radio-frequency amplification may be used before, and audio-frequency amplification may be used after the detector tube with a corresponding increase in the receiving range of the set. Since the circuit makes use of impedance coupling there are three adjustments to be made for each change in wave length, namely, condensers "C," "C-1" and "C-4." The potentiometer, "P," is essential in this circuit since it tends to keep the grid of the first tube at a negative potential with respect to the filament. The other constants of this circuit are as follows:



Simple but effective radio-frequency circuit

L=honeycomb or other coils; the sizes depending upon the wavelength range to be covered. C=.001 mfd. C-1=.0005 mfd. C-2=.0005 mfd. C-3=.005 mfd. or larger. C-4=.0005 mfd. P=200 or 400 ohm potentiometer. R=50,000 ohms; exact for Radiotron tubes. R-1=2 megohms; exact for Radiotron tubes.

EXPERIMENTERS' WORLD

Views of readers on subjects and specific problems they would like to have discussed in this department will be appreciated by the Editor

Indoor Antenna With Crystal Set

By Thomas S. Towle

FIRST PRIZE, $10.00

WHEN it is impracticable to put up an outside antenna for a crystal set, the radio amateur should not be discouraged as it is possible to get satisfactory results from an antenna constructed within the house. The first type that I tried was a miniature of the ordinary outside aerial and consisted of two insulated wires strung near the ceiling of a hall twenty-five feet long by four feet wide. The ground wire ran the full length of this hall under the rug to water pipes in the kitchen. Insulated bell wire was used with no further insulation. Very good results were obtained with a simple variometer for tuning and a galena detector as shown in figure 1.

One day the ground connection at the water pipe was broken and I discovered that the signals were just as loud as before and that the only difference was a slight change in the tuning of the set. For several months this aerial-counterpoise system was used to pick up local amateur stations and the Westinghouse broadcasting station KDKA in East Pittsburgh about six miles due east.

In an effort to eliminate local interference, the outer ends of this aerial-counterpoise system were connected together to form a large loop twenty-five feet long by seven feet high and pointing east and west toward KDKA. This was tuned by a variable condenser as shown in figure 2, and very strong signals were obtained from KDKA. This arrangement had the added advantage that the directiveness of the loop eliminated much interference from local code stations. More turns were added to this loop but it was found that two turns gave the loudest signals. With this arrangement the General Electric Station, WGY, at Schenectady came in with good signal strength from a distance of about 350 miles and at an angle of about 30 degrees with the direction of the loop. This was with a crystal detector.

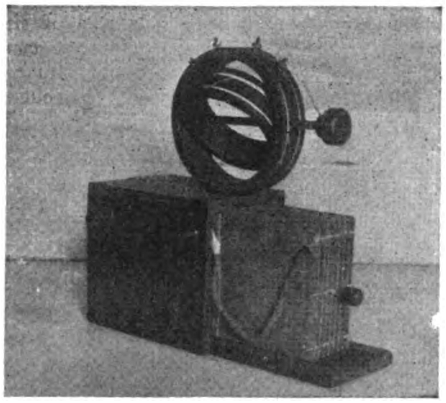


Figure 3. Home-made variometer and variable condenser

While experimenting with this loop, a variometer and variable condenser as shown in figure 3 were used. These were made by the writer ten years ago. They were connected to the loop as shown in figure 4 and good results were obtained. Although this antenna system gives good results with a crystal detector, much better results can be obtained if vacuum tubes are used and a brief description of their use will be given to show how easily the amateur can change over from the crystals to the vacuum tube detector.

The diagram in figure 5 shows how the connections between the stator and the rotor of the variometer were separated and the set made regenerative with the result that much louder signals were obtained and CW stations were picked up. With this hook-up, WGY can be heard with the head 'phone lying on the table. When using two stages of radio frequency amplification without regeneration, the Detroit station WWJ and the Indianapolis station WOH can be heard clearly. With the addition of two stages of audio frequency amplification, these stations can be heard "all over the room" with a Baldwin receiver without a horn.

A good way to extend the field covered by such coil antennae is to install two in a room on walls at right angles to one another and by means of a simple throw-over switch the operator can change from one to the other and cover most points of the compass. This is shown in figure 6.

The above shows that a loop or coil antenna of these dimensions makes it possible for one to enjoy the radio broadcasting with a crystal detector and simple tuning apparatus if he is within reasonable distance of a broadcasting station.

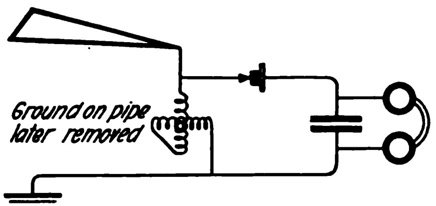


Figure 1

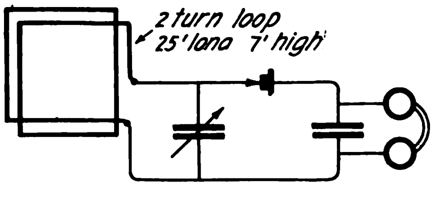


Figure 2

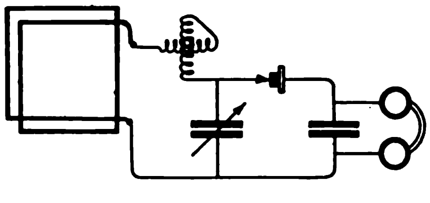


Figure 4

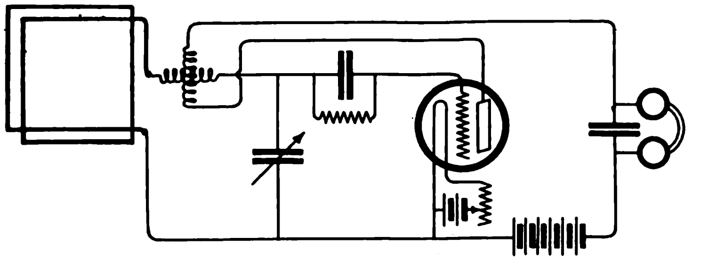


Figure 5

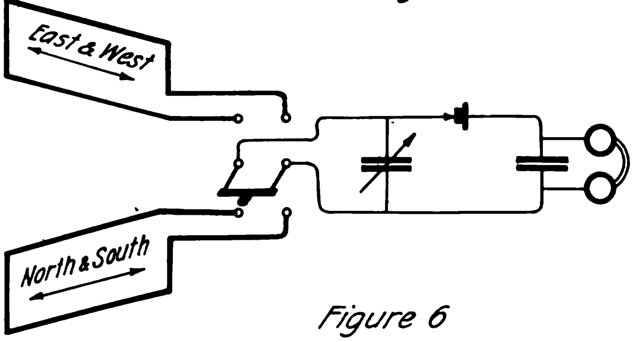


Figure 6

Figure 1. First antenna in 25-foot hallway. Figure 2. Modification into a loop. Figure 4. Addition of variometer for tuning. Figure 5. Ease of converting to a bulb set. Figure 6. Use of two fixed directional antennas

Crystal Receiver With Indoor Aerial

By Gustav Schoch

SECOND PRIZE $5.00

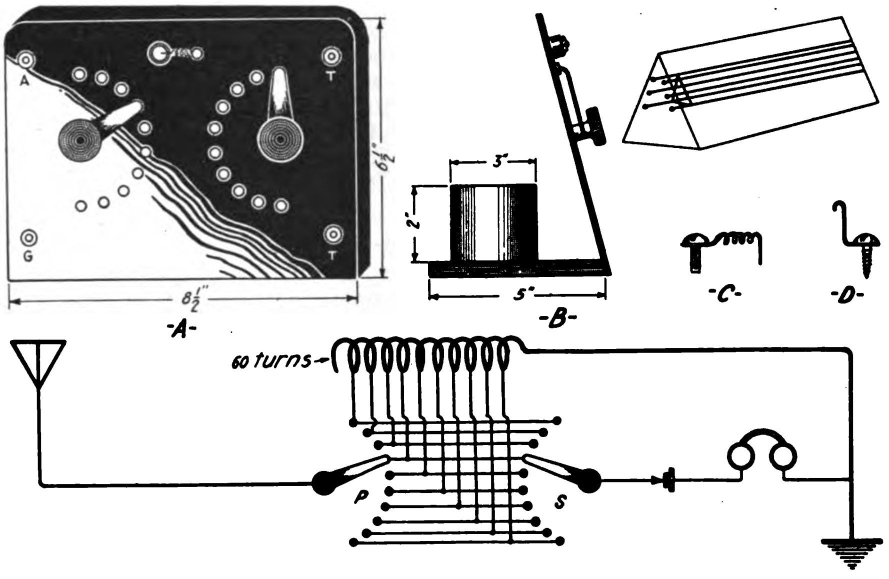
After making and using many types of crystal receivers I have come to the conclusion that the following type gives best results:

This set costs very little to build and is very sensitive for a crystal set. It works on the auto-transformer principle, having but one coil for both primary and secondary. To construct the coil procure a cardboard tube 3 inches in diameter and 2 inches long. On this wind 60 turns of No. 26 to No. 30 wire. Bring out a tap every 6 turns. When the coil is finished there should be nine taps, and the ends of the coil, making eleven leads in all.

Drill a panel as in sketch "A." For binding posts I used machine screws with battery terminals. For switch taps I used machine screws. The switches cost ten cents each at Kresge's (used to be 40 cents. Nine rahs for Kresge). The detector is merely a coiled spring bolted at one end—figure "C." Fasten the tapped coil to the base with two copper strips bent as in "D." Now connect as per diagram. The switch with the detector and phones in series with it will be the secondary.

Tap P_1 is connected with a jumper to tap S_1, then to last tap on coil. Tap P_2 is connected with a jumper to tap S_2, then to 2nd last tap on coil, etc.

My aerial is composed of eight strands of No. 14 wire, 23 feet long, connected in cage type, triangular shape, and installed in the gable of our house as shown in the sketch. All wires are shorted at one end with a rat tail lead-in on opposite end. This aerial and set have given very good results on local concerts. In cold weather it will do much better. The set is grounded to a water pipe in basement.



Simple and ingenious crystal tuner and detector with triangular cage-type antenna strung inside the gable roof of the house

Indoor Antenna With Crystal Set

By Andre L. Merle

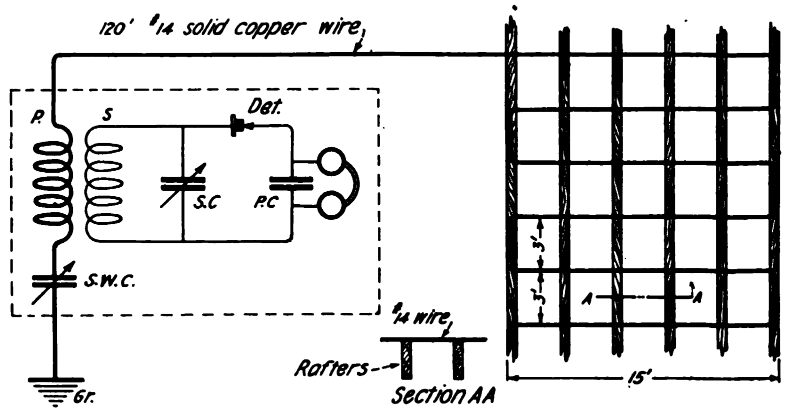
THIRD PRIZE $3.00

With the set which I am about to describe, using an indoor antenna fastened to the rafters in the attic, I have been able to hear the concerts from WJZ, WNO, WOR, WWZ, WEAM, 2XB, 2XJ, and a few Second District phone sets within ten miles. I have also copied most of the Second District stations which use I.C.W. and sparks and also ship stations at sea, numerous land stations, WCG, WNY, WSE, and naval stations. With additional inductance in the primary I copy NAA'S press and NAH'S weather.

The antenna is No. 14 solid copper wire about 120 feet long using a water pipe for ground.

My crystal set consists of an inductively coupled thirty-five turn honeycomb coil; a short wave condenser .001 mfd., a secondary condenser .001 mfd.; crystal detector—dust proof type—and a small fixed condenser .0005 mfd., with standard pair of 2000 ohm phones shunted around it.

The short wave condenser and secondary condenser are very critical. This set is used about thirty miles from New York City.



How the antenna was stretched over the rafters

Duplex Radio Transmitting System

(*Continued from page* 68)

waves. Upon closing the keys, the devices G and J, for example, are simultaneously operated, changing the value of the tuning inductances of the radiating circuit, and hence the frequency of the radiated wave, and also changing one of the constants of the impedance circuit, which in the case shown is the capacity. The closing of the other key has the same effect upon the radiating circuit, and the other impedance circuit. It is essential to the successful operation of this system that both the "normal" and the "signaling" waves shall be selected of such a frequency as to satisfy the condition that the impedance of each impedance circuit shall be negligible to the oscillating currents of the radiating circuit of which it is a part.

Efficient Aerial Insulation

By G. N. Garrison

PARAPHRASING an old saying, an equal truth might be stated that a radio installation, be it either for transmission or reception, is no more efficient than its weakest point.

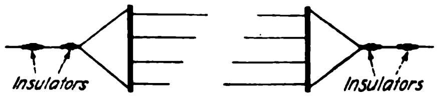
It has been the writer's experience that nine times out of every ten, that weak point can be traced directly to the manner in which the aerial has been insulated.

When it is considered that in reception the amount of incoming energy, even from nearby powerful stations, that strikes the aerial is so small as to be almost infinitesimal the great importance of a well-insulated aerial cannot be over stated.

The aerial which contains the greatest number of insulators is not of necessity the best insulated aerial. In fact this is very seldom the case.

In reception it is essential that the little energy in the form of electro-magnetic waves that strike the aerial, alternate between aerial and ground through the primary of the receiving transformer—if one is used—and not dissipate itself to ground through the faulty or insufficient insulation of the aerial system.

How often one sees on our city housetops or other convenient places multi-wire aerials whose owners intended that they be very well insulated. In consequence we find that each individual wire of these aerials has one or more insulators at either end which is supposed to insulate these wires from their supporting cross-pieces and from the earth. In reality they do nothing of the kind; or at least not as efficiently as their builders desired for one of radio's fundamental laws has here to be contended with.



Arrangement of Insulators

An insulator of whatever kind is nothing more or less than a non-inductive resistance and it is well known that when two or more resistances are connected in series their total resistance is equal to the sum of the resistance of each separate resistance; or,

Total resistance=R and R' and R'' and R''' etc.

However, when we have a number of insulators or resistances connected in parallel, an entirely different rule applies, for then the total resistance is equal to the reciprocal of the sum of the reciprocals of each resistance: or,

$$\text{Total Resistance} = \cfrac{1}{\frac{1}{R} \text{ and } \frac{1}{R'} \text{ and } \frac{1}{R''} \text{ and } \frac{1}{R'''} \text{ etc.}}$$

Now with an aerial constructed as above mentioned we have a number of resistances all connected in parallel, and the total resistance of such an aerial system, in consequence, must be less than the resistance of any one of its insulators.

Since one of the factors entering into the efficiency of an aerial is its insulation it is self-evident that our insulators must not be in parallel. This fact is all the more pronounced should one of the insulators have a leakage slight or otherwise, which due to surface leakage it always does have during and immediately following a rain storm; for then the total insulation of our aerial would be less than the resistance of the leaky insulator.

Obviously then the most efficient aerial would be one whose insulators were all connected in series and the most efficient way to accomplish this is shown in the accompanying diagram.

Perhaps one of the strongest arguments in favor of a "series-insulated" aerial is the fact that Uncle Sam uses such a system on all his installations, and Uncle Sam has the reputation of knowing what he is doing.

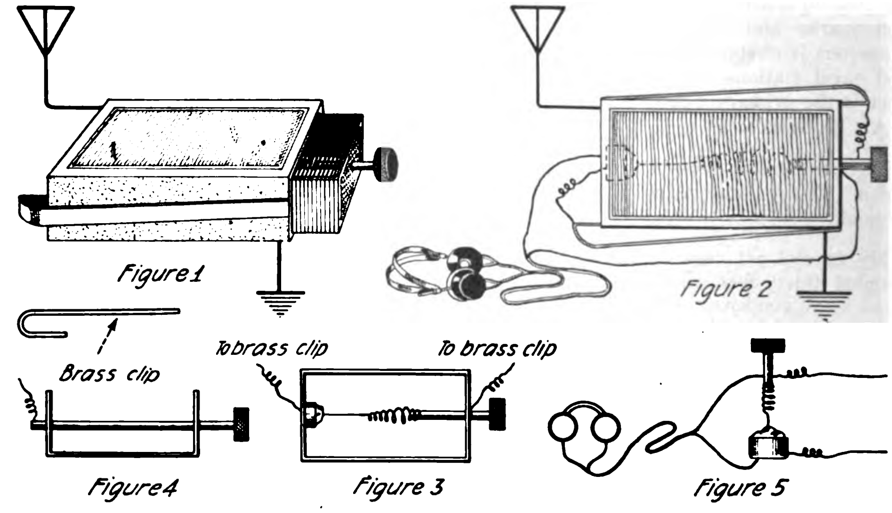
A Safety Match Box Radio Receiving Set

By Harold Daum

A RADIO set can be made in a safety match box which will receive from a radius of twelve miles under ideal weather conditions.

The match box is first boiled in paraffin to eliminate capacity and then wound with enough turns of No. 26 S.C.C. wire to fill the entire box. Leave plenty of wire on each end to make connections to aerial and the ground.

Each narrow side of the box is sandpapered to make a good contact with two brass clips that are fastened to the inner box in such a manner that when the box is moved the clips move and consequently the coil is tuned.



Constructional details of safety match box radio set

The detector is fastened to one inside end of the box as shown in figure 3. It rests on a bearing which is made as shown in figure 4. The bearing is threaded and when it is desired to make a change in the adjustment of the crystal the knob is turned. A glance at figure 5 shows how the detector knob is made. This unique construction, using a bolt, makes it possible to either slide the box and tune in, or turn the knob and adjust the crystal.

The antenna wire is connected to one end of the coil and the other end of the coil to the ground. One brass clip is connected to the end of the crystal cup, the other brass clip is attached to the cat whisker.

Modulation and Distortion in Radiophone Sets

By Albert F. Murray

DON'T ask "How Is My Modulation," but say instead "How Is the Quality"? The former question is asked by amateur operators of radiophones nearly as often as the historic "How is my spark" query. The answers often vary from "Poor" or "Fair" to "Fine" or "Perfect." Of course, what the transmitting operator really means is, "How is the quality"? for it is the quality and not the modulation upon which the ordinary receiving operator is able to report. Let us see what is meant by modulation and quality when applied to the radio telephone transmitter.

Modulation, in a broad sense, means the moulding of the carrier-wave by the voice frequencies. The degree of modulation can be expressed in percentage and is usually taken as the ratio of the amplitude of the audio frequency to that of the radio frequency, or, referring to figure 1, as the ratio B|A.

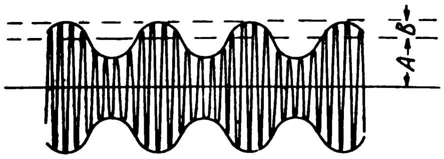


Figure 1—Per cent modulation is B/A × 100

Complete, or 100 per cent. modulation would mean that A—B; this is seldom obtained in practice, 60 per cent. to 80 per cent. being considered a very good degree of modulation.

The response at the receiving station is proportional to the product of AB. (A "square-law" detector is assumed, that is, a crystal or non-oscillating vacuum tube.)

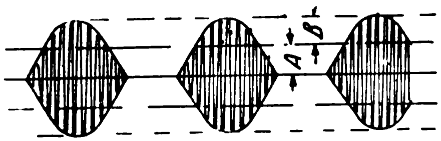


Figure 2—Over modulation

When the amplitude of the voice frequency exceeds that of the carrier-wave, over-modulation is said to occur. As a result, the antenna current remains at zero for an appreciable length of time between audio-frequency groups, as shown in figure 2.

Evidently distortion is present in the transmitted wave and it can be detected by listening in a wavemeter receiver, or, in this one case, the report from a receiving operator as to the "modulation" will be of aid, provided he is able to identify over-modulation by the resulting poor quality of speech. To check up this fault, vary the distance between microphone and speaker; if the speech quality improves with an increase in distance, it is probable the radiated wave is being over-modulated.

Under-modulation, is the reverse of over-modulation and therefore is the condition that exists when the amplitude of the signaling wave is less than the amplitude of the carrier-wave. The speech, as far as degree of modulation is concerned, will be clear and of good quality, but will diminish in volume—loudness—as the per centage of modulation decreases.

The most desirable modulation, from the viewpoint of both quality and signal strength, is obtained when the carrier-wave is modulated equally upward and downward and by a signal wave whose amplitude is such as to vary the radio-frequency from zero to twice its non-signaling value, as is shown in figure 3.

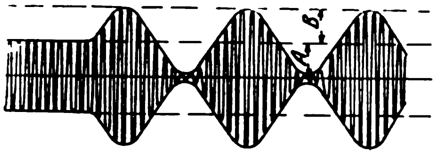


Figure 3—Equal upward and downward modulation A = B

Modulation upward is not always possible and the modulated wave may have the form of that in figure 4, where the oscillator output cannot increase to the desired value; due, for instance, to lack of filament emission. The distortion of such a wave is quite marked.

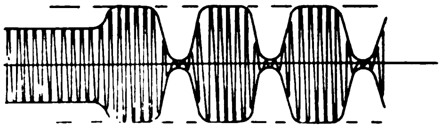


Figure 4—Incomplete modulation due to insufficient filament emission

Downward modulation can only be expected from an oscillator which is adjusted for maximum output and then grid modulated. This is also true of absorption modulating methods. It does not necessarily mean poor quality, but it does mean that, if two tubes are used in parallel and adjusted for maximum output as oscillators and their output modulated by grid or absorption methods, the received signal strength for complete modulation will be about 50 per cent. of that obtained when the two tubes are used under the same conditions as oscillator-modulator, in a plate modulating circuit. This is made evident by comparing the areas per audio cycle under the two curves in figure 5. In practice, the ratio of effectiveness is usually less than 50 per cent. because, with some tubes, the non-signaling output for grid modulation can be increased above that shown; also in the case of plate modulation, results are sometimes limited by heating of the modulator tube.

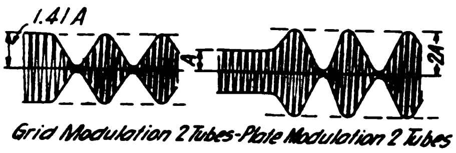


Figure 5

Quality, as applied to voice transmission, has to do with clearness of speech. Good quality means absence of distortion, and distortion can be completely eliminated only when the complicated speech wave impinging upon the microphone at the transmitter, is faithfully reproduced at the distant receiver so that: firstly, the amplitude of the received wave is proportioned to that of the original; secondly, the various voice frequencies are retarded equally. There must be a linear relation bebetween response and excitation.

In tracing the voice frequencies from the speaker's lips to the aerial system, we come first to the microphone Dr. Goldsmith in his book on "Radio Telephony" states that the microphone is "a fairly prolific source of speech distortion, or rather speech destruction." But since, from necessity, we must use microphones, let us pick up a good one. A Western Electric Company expert advised the author that a W. E. Co., Type 323W microphone has an output of about 20 per cent. more energy than other types. However for special uses, a low resistance microphone such as W. E. Co. Type 349BW or Type 318W may give better results, depending upon the impedance of the load into which it works. One way to eliminate microphone distortion is to talk into a telephone receiver and add a few voice amplifiers to obtain the necessary power, or a condenser transmitter might be used.

Most of the modulation transformers on the market are designed so that distortion arising from saturation of the iron core and from other effects is slight. For best results, be sure that your microphone A. C. resistance approximates your transformer primary impedance at, say 800 cycles, and that the secondary of the transformer is wound for the type of tube that it is to control. Sometimes connecting a ½ to 1 megohm resistance across the secondary will improve the quality, as it causes the device to operate more uniformly through the voice frequency range,

A brief comparison of the relative quality obtainable from absorption, grid and plate modulation methods may be of interest. Here the thing to keep in mind is that the response should be proportional to the excitation.

(a) Absorption modulation—If the antenna resistance is varied in direct proportion to the amplitude of the sound waves, good quality should result. In spite of what was said above about the microphone, fairly good articulation results from using a microphone in the ground lead or in a loop coupled to the antenna inductance.

Control curves of a Radio Corporation magnetic modulator, taken by the writer, show that this absorption device is quite critical as to mean control current and that changing the working wavelength on either side of 200 meters produces marked changes in the results. Under some conditions, the control curves are approximately straight lines, but under others they are not. These curves and measurements may be published later.

(b) Grid Modulation—A typical grid control curve is shown in figure 6.

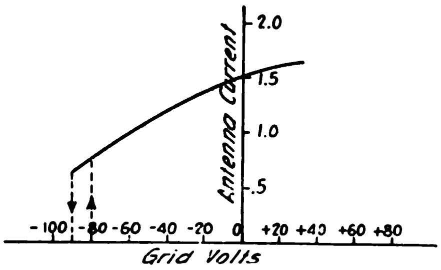


Figure 6—Grid control

The lower part of the curve, as far as it goes, is nearly a straight line, but at the upper end it bends over. It will be seen that the oscillations cease and the antenna current falls to zero when the grid is pushed sufficiently to the negative voltage. Oscillations do not commence until the control voltage is placed at some value less negative than that at which oscillations cease. Evidently considerable distortion would result if the modulating voltage operated over a greater range than that covered by the full line curve. By careful adjustment of the variables of the oscillator, it is conceded by authorities on modulation that the antenna current can be varied from zero to a maximum value along a more or less straight line, but such an adjustment will give neither high efficiency nor much output.

(c) Plate Modulation — Compare with the preceding curve that of figure 7 which is the plate control curve of an oscillator—in whose grid-circuit is a condenser and leak resistance.

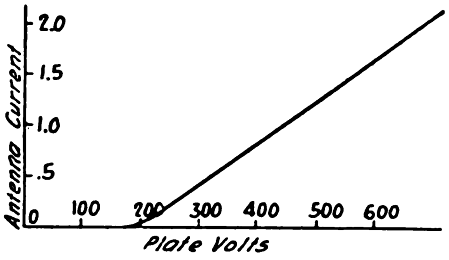


Figure 7—Plate control

For plate voltages exceeding 200, we see this curve is a straight line, and therefore if the plate voltage is not reduced below 200, good quality should result when using this method of modulation.

When amplifying tubes are used their grids should be biased by a battery so that the tubes operate over the straight portion of their characteristic curves. The input voltage should not be so great as to cause the plate current to cut-off at the bottom and reach saturation value at the top, as in figure 8.

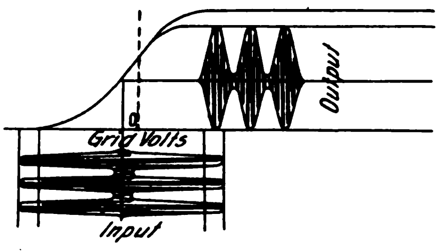


Figure 8—Amplifier distortion

It is to be noted that Mr. A. S. Blatterman, in "Comparison of Modulation Methods in Radio Telephony," finds that more modulated energy is radiated when the impressed voltage on the amplifier is such as to cause saturation, as in figure 8.

When using a low decrement antenna for radio telephony, serious distortion may result from the "fly wheel" action which tends to round off all the sharp corners of the voice wave, so necessary for good speech. Some type of antenna which has a fairly high resistance—a large part of which should be radiation resistance— is desired. This matter becomes of greater importance as the wavelength is increased, because the tone efficiency decreases, due to the overlapping of wave trains whose group frequency is high.

These are some, by no means all, of the points which should be looked into if speech of good quality is to be radiated from your antenna. I would advise the amateur to take control curves of his various controlling devices and see if they approximate straight lines. The static characteristics thus obtained do not necessarily indicate the conditions that obtain when the radio set is in operation, but they will be a guide in making adjustments that may improve the quality of speech from your radiophone. At those transmitting stations where the hum from rectified A. C. makes speech far from pleasant to the receiving operator, the intelligent use of Campbell filters, or very large capacities, will certainly decrease this nuisance.

Since this article deals primarily with the transmitter, attention will be called, only in a brief way, to conditions causing distortion in the receiving apparatus.

(a) Low decrement in either antenna or secondary circuits will cause distortion because of the previously mentioned "fly-wheel" effect. Higher voice will be suppressed because the narrow resonance curve of the receiver will not include these side-frequencies—see figure 9.

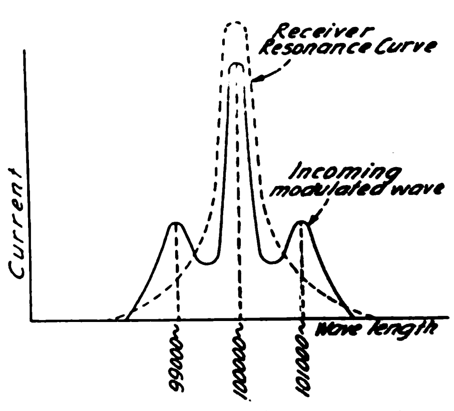


Figure 9—Distortion of modulated wave due to low receiver decrement

(b) Regeneration, of course, will reduce the decrement of say, the secondary circuit to almost zero, and every operator knows that too much regeneration spoils the quality although it greatly increases the volume. While reception by the zero-beat, or homodyne method, will give understandable speech when the incoming signal is so faint that it cannot be heard otherwise, the writer believes with his limited experience, that this method requires too careful adjustment on short wavelengths to be widely used at the present time.

(c) Inter-tube audio transformers when, not properly designed—and there are such on the market—can render unintelligible, incoming speech which is really of good quality. The same factors mentioned in regards to the modulation transformers apply here and a high resistance shunt across the transformer secondary will help although it will greatly decrease the degree of amplification.

(d) The amplifying tubes should, of course, have their grids so biased that they operate on the straight portion of their characteristic curve.

(c) There is always some distortion present in electro-magnetic reproducers such as telephone receivers and loud speakers which might be eliminated by condenser, hot wire (or hot air) receivers. When the signal frequency coincides with the natural frequency of the diaphragm of a receiver, or loud speaker, the response is out of all proportion to that obtained with the same signal strength of a slightly different frequency; thus distortion obviously arises.

To receiving operators let me say in conclusion: Do not always blame poor quality on the transmitting station, because the trouble may exist in the receiving set.

Antenna Resistance

By Lester P. Burt

SINCE there seems to be widespread misconceptions regarding the meaning of antenna resistance and radiation resistance, perhaps it will not be out of place to call the amateurs' attention to these terms. Antenna resistance is rather an artificial term coined to give in absolute terms a measure of an elusive quantity that is of vital importance.

The entire term "antenna resistance" represents the fictitious resistance which could be inserted in a circuit of the same oscillation constant as the antenna to absorb the same amount of power as used up by the antenna. The substitution method of measuring antenna resistance is a literal translation of this definition. Since it is necessary to have a wavemeter and an accurate standard of resistance to take a curve of antenna resistance, some amateurs may feel it is beyond them. But if they are interested in efficient sending, they will find it well worth while to borrow the instruments from a radio club or high school or even to buy them. It introduces the amateur to the how and why of things instead of the blind cut-and-try methods by which most experimenters do a great deal of work and find out very little of real value and improvement to the art.

The diagram gives the general set-up of the apparatus to take an antenna resistance run on an antenna. It will be noted that a wavemeter of wide range is needed and if several coils are used to cover the range it will be necessary to make sure that there are no "jumps" in the curve due to inaccurate calibration.

In figure I, C_3 is used for waves below the fundamental after which it is taken out as indicated by the dotted line. L_1 must be finely variable. If necessary, two or more load coils may be used in series for the last points on long waves. Resistance R must be calibrated accurately and need not go above 20 ohms for even a very poor antenna. If possible it should read to tenths of an ohm. L_2 is a temporary coil wound about the wave meter coil, or coupled to it, but not too tightly. Probably four or five turns and rather tight coupling will transfer the most energy. By varying L_1 and watching the galvanometer, the outfit can be checked to see if coupling is giving two resonance peaks — if so, loosen it. The galvanometer may be anything that will register a weak radio current. C_1 and C_3 may be any variables and the galvanometer scale is not important as the circuit is only adjusted to give the same readings and the current in milliamperes is not required. Condenser C_2 across the buzzer coils should be large, say 1 mfd. or more to prevent sparking and resultant unsteadiness in the high frequency current. R_1 is only to smooth buzzer operation and can be omitted perhaps and the contacts carefully adjusted instead.

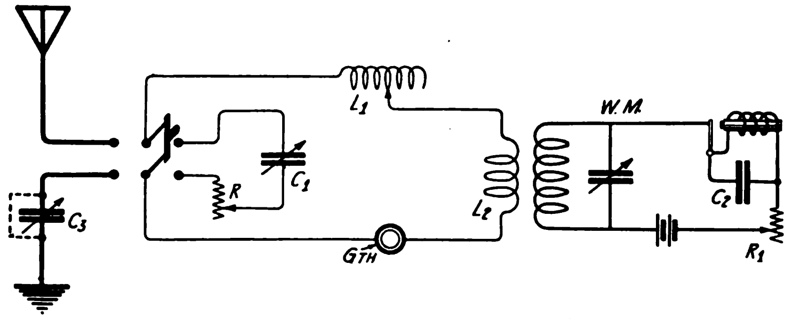


Figure 1. Diagram for testing antenna resistance

Strictly a small inductance should be in series with C_1 equal to the antenna inductance, but is so small results will hardly show the difference without it. The wave meter is set to any wave desired and buzzer started. Switch is thrown on antenna and L_1 varied until galvanometer reads a maximum — antenna then being in resonance. Switch is thrown over to "dummy" circuit and C_1 varied until the dummy circuit is in resonance. If R is all out, the galvanometer deflection will be large and it may be necessary to add resistance to keep the needle on the scale. When the dummy circuit is in tune add resistance at R until meter reading is the same as for real antenna. Switch back to real antenna again to be sure buzzer current has not changed. Value of R is the antenna resistance and is plotted against wave length.

Above the fundamental with C_3 cut out, when C_1 is adjusted, it will not have to be disturbed and only L_1 will be varied. With series condenser C_3 in, C_1 must be adjusted separately for each reading as in this case L_1 will be out of circuit and capacity of antenna circuit is varied by C_3. The point taken with C_3 and L_1 out of circuit comes just above the fundamental and is close to the point at which the antenna is used for sending, for L_2 is nearly the inductance of an oscillation transformer. The real purpose of this article is, however, more to call attention to the interpretation of these curves than the manner of taking them, since the former seems to have been generally neglected. Three terms make up antenna resistance:

(1) Radiation resistance, representing the component of power radiated into space.

(2) Ohmic—or heating—resistance due to the conductor or conducting surfaces, and eddy currents and skin effect in same.

(3) Dielectric absorption resistance which dissipates power in the dielectric field about the antenna.

It is evident that the experimental curve of an antenna represents the sum of these losses at every wavelength. Radiation resistance, for a given antenna, is known to vary inversely as the wavelength. This is for an isolated antenna away from other absorping circuits, such as other antennae, etc. The shape of the curve can be understood without going into curve analysis for its equation is $R_{rad} = \frac{K}{\lambda^2}$ and it is clear that doubling the wavelength will reduce R_{rad} to ¼ of its former value, etc. Such a curve rises steeply at short waves and drops to extremely low values at waves several times the antenna fundamental.

Were skin effect entirely absent, the conductor heating losses would be constant at all frequencies. With stranded non-magnetic conductors, the skin effect variation over a wide range of wavelengths is very small. The curve will bend down slightly since skin effect is most noticeable at very high frequency, or short wavelengths.

Dielectric absorption is found to vary inversely as frequency or directly as wavelength. This on a curve sheet shows as a straight line through the origin. The energy used up in the dielectric probably appears as heat originating in the imperfect dielectric material. Steinmetz, however, doubts if this action is similar to magnetic hysteresis and suggests that a part of the energy may be expended in mechanical or molecular changes in the dielectric. This may explain dielectric fatigue by which an insulator finally breaks down similar to mechanical fatigue of metals under live loads. However, it is an experimental fact that the loss plots out exactly as a straight line for power condensers and is quite noticeable for glass of poor grades. This loss must not be confused with dynamic leakage through a path of high resistance in the dielectric.

Figure 2 shows the component curves and the total obtained by adding the ordinates. Given an experimental curve it is easy to find the relative values of the three components for that antenna.

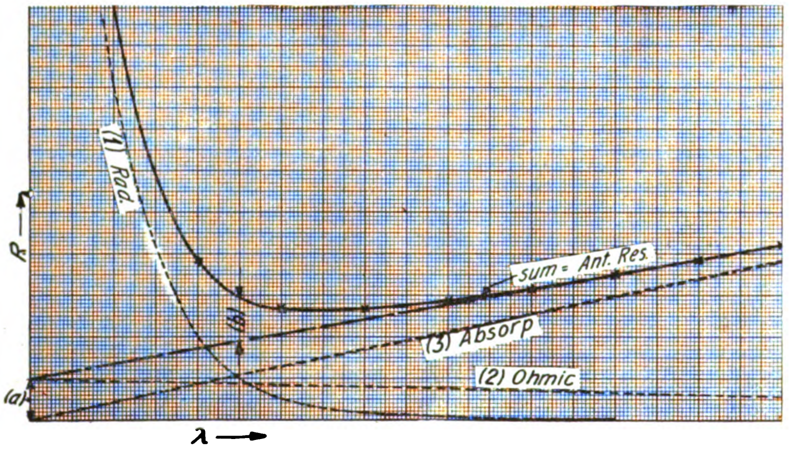


Figure 2. Component curves in measuring antenna resistance

Be sure the end of the experimental curve includes at least three points exactly on a straight line. Produce this line back to cut the vertical axis. The steepness of this line shows, in a relative way, how serious dielectric absorption is on the antenna. Ship antennae show very slight rises since there no bad dielectrics such as trees and masonry about. Most ships have so much iron and steel framework that is "grounded" that the wooden parts cannot affect the high intensity field much, for they are not in it. But antennae on the roofs of buildings and in trees, even in the winter time, show a great rise which is of course undesirable. The intercept (a), on the vertical axis represents roughly the ohmic resistance of the antenna. The difference (b) between the straight line produced and the actual curve taken is the real radiation resistance. This method assumes that the curve is continued until the radiation resistance is too small to show on the scale to which the curve is plotted.

By trying different grounds and wiring the amateur can greatly improve the true radiation by reducing the wasteful losses of his limited power. This is the part that the hot wire ammeter does not tell you anything about and by watching this you may cover more distance than the fellow who wrongly thinks he is getting several times your radiation but is really sending it into a high resistance ground. Figure 3 shows how conditions can be judged from the general shape of the curves without much measurement. (A) is high absorption and (B) is a high resistance ground or joint. Two or three cases have been noticed where the straight part of the curve produced gave a negative intercept, which of course should not be. In all cases these were either antennae on buildings with long and crooked lead-ins or were freak antennae with parts of different characteristics so the variation was more complicated than for the standard flat top construction.

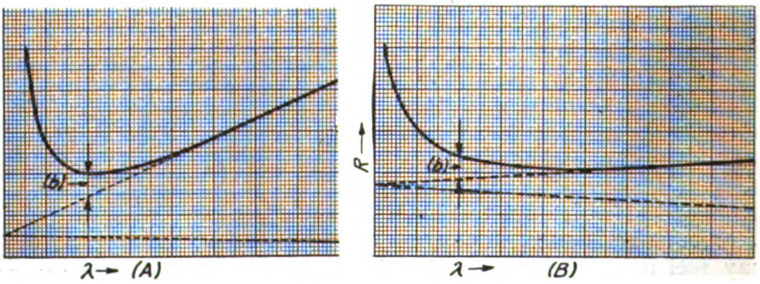


Figure 3. Antenna curves of typical shapes

Commercial companies have adopted the multiple tuned antenna on long waves. The amateur anxious to increase his range could well do the same and in view of his wavelength, the cost would not be extreme if he had space. By this the wasteful resistances of the antennae are put in parallel but radiation occurs from both so the system operates at higher efficiency because the wasted energy is reduced with the same antenna input. This will involve extreme care in tuning or results will be very poor and also some outlay for good-sized conductors. An outdoor tuning inductance for 200 meters should not be a great problem and only two antenna supports separated twice the distance used for the average 200 meter antenna are required, for leads can be dropped from the middle to the inductance. In this way the antenna efficiency can be brought up to values undreamed of a short time ago and no one can say what the distance limits are for even 1 KW.

A Loud-Speaker on 60-Cycle A.C.

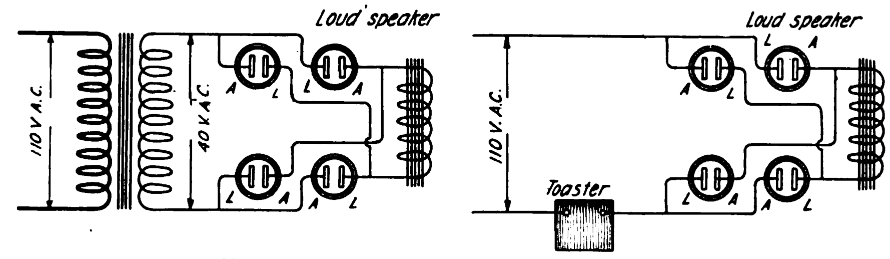
By James C. Ryder

THERE is no denying the fact that the loud-speaker is a boon to the radio enthusiast. It has converted many an unhappy radio bug whose wife has become a radio widow to a smiling, genial person who can invite the neighbors in to enjoy the concerts and lectures in a group while he sits proudly by turning a knob now and then with a knowing air. But there is also no denying the fact that the loud-speaker puts an additional load on the storage battery which runs down all too soon with a three tube set, this load eventually being transferred to the aforesaid bug, who trundles the battery to the nearest garage for another charge.

The writer has been successful in making the loud-speaker independent of the storage battery without sacrificing quality a bit and will describe the method for the benefit of other enthusiasts who are not fortunate enough to possess a battery charger. We have 110-volt A.C. power in our apartment. This of course cannot be used even through a suitable resistance on the loud-speaker on account of the 60-cycle hum which would drown out everything else. However, it is entirely possible to rectify this power by means of the lead-aluminum-borax rectifier so often described in this magazine.

The first requirement is four one-quart Mason jars. In each jar should be placed two plates, one of sheet lead and the other of sheet aluminum. They should be approximately 1½x7x⅛ inches in size and they should be supported so that the lower ends are at least ½ inch from the bottom of the jars. A convenient way to support the plates is to make four blocks of wood 1 inch square and 4 inches long. These blocks should be well shellacked and then allowed to dry. When they are thoroughly dry a lead plate is fastened to one side with a screw and an aluminum plate to the other side. The blocks serve as spacers between the plates and being longer than the diameter of the openings of the jars will rest on the edges and hold the plates off the bottoms. A binding post should be attached to the upper end of each plate so that the proper connections may be made.

The jars should now be filled about two-thirds full of a saturated solution of Mule Team borax. Having due respect for the floors of our rooms we placed the four jars in a glass tray used in photographic work so that any spill was prevented from reaching the floor. The four cells were connected up as shown in the accompanying sketch. This method of connection takes advantage of both sides of the cycle.



Circuit diagrams of the rectifiers for 60-cycle A.C.

The family toaster was now mustered into service as a resistance. It was hooked up in series with the rectifier as shown and the whole outfit connected to a lamp socket. The field of the loud-speaker was hooked in beyond the rectifiers. The toaster proved to be of just the right resistance to bring the current down to the right amount. An electric flat iron will serve nearly as well. It would seem that a filter circuit would be necessary to smooth out the variations in the power. However, after trying out several such circuits and finding that the apparatus worked just as well without them we came to the conclusion that the field of the loud-speaker acted as a choke coil itself.

It soon became evident that a lot of energy was wasted in the toaster in the form of heat. The next step, therefore, was to build a small transformer. This transformer had a laminated core of sheet iron 1½ inches square and 7x9 inches outside dimensions. The primary consisted of 380 turns of No. 16 cotton covered magnet wire which was wound on a form and slipped over one leg of the core. The secondary consisted of 152 turns of the same size wire. This ratio gives a secondary voltage of 40 which seems to be just about right for the rectifier. Lower voltages do not seem to work well.

The rectifier and loud-speaker was hooked up to the secondary of the transformer as shown and the primary connected directly to the lighting socket. Do not be alarmed if the loud-speaker is somewhat noisy at first. It takes several hours for the plates to form properly. Patience is all that is necessary at this stage. It may be necessary to replace the aluminum plates after several months and it will be necessary to add water to the jars from time to time. Otherwise the apparatus will give no trouble whatever. The writer has used a rectifier of this type for several months now and finds it very satisfactory.

Lightning Protection

By Howard S. Pyle

IN CERTAIN sections of the country, during the period when thunder storms are common, many radio enthusiasts appear to have fears that their antenna system will attract lightning, and cause property and possibly personal damage. Such is not the case; in fact, entirely the opposite is true.

A custom which was common not so many years ago was the installation of lightning rods on homes, barns, etc., in the belief that, should lightning strike the building so protected, it would "run down" the lightning rod, directly into the ground. When it is considered that the force of lightning is so great as to shatter large trees, and even entire buildings, it will be realized that a mere metallic rod would hardly pass such monstrous currents to the ground without damage. Investigation has proved that where the protective value of lightning rods is concerned, it is not with the passing of the actual lightning bolt to ground, but acts in an entirely different way.

Lightning will be attracted to the vicinity in which the atmosphere is most heavily charged with electricity. Naturally, then, if the atmosphere surrounding a building contains considerable atmospheric electricity, it offers a better point for the lightning bolt to free its energy by a discharge to ground. Again, should one building within the charged zone be tall, and the other short, almost invariably the taller building will receive the effects of the lightning discharge. But—if we provide some means of draining the atmospheric electricity from the atmosphere, we render the surrounding atmosphere more immune to the reception of a lightning discharge, due to its greater insulating qualities, and consequent more difficult path to the ground for the lightning discharge, which will then seek an easier path. This is the way in which the lightning rod serves; it provides a leakage path to ground for the atmospheric electricity, and serves to keep the air free from such electrical activity in its immediate locality.

Lightning rods are generally constructed of iron, which has fifty times the resistance of copper. In other words, were they constructed of copper, with copper connection rod to the earth, they would be fifty times more efficient. They are generally but a few feet above the roof of the building.

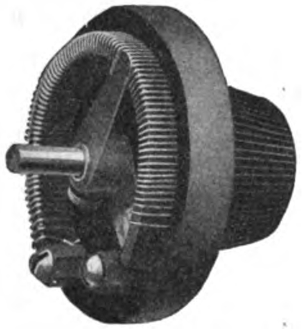
Now compare the average radio antenna. To serve its purpose of radio reception satisfactorily, it must be constructed of copper or phosphor bronze, both of far greater conductivity than iron. It must also be raised ten or more feet above the building or other objects which it crosses. In other words, it should be the highest object within several hundred feet when possible. Isn't it reasonable to assume then, that it would serve a great deal more efficiently than a lightning rod in draining the atmosphere of its electrical activity? It does, as has been proven, and a well constructed antenna which is properly grounded during a thunderstorm is a far greater lightning protection to the property in its immediate neighborhood than any number of lightning rods as usually installed.

NEW APPLIANCES AND DEVICES

New Non-Magnetic Filament Rheostat

THE new filament rheostat, manufactured by the Central Radio Laboratories, 303 16th St., Milwaukee, differs from other rheostats designed for radio equipment in that no magnetic material is used in its construction.

Genuine Thermoplax, of extremely high insulating and heat resisting properties, is used for the base. The resistor is made of a special non-corroding alloy, which always presents a polished surface. Its ohmic value is calculated to give a maximum sensitiveness within the required range and its current capacity is ample for the control of any receiving tube, without heating. Each turn of the resistor is firmly anchored so that there is no possibility of noisy or scratchy operation.



The Thermoplax rheostat

The control shoe is broad and flat with its edges turned up to insure smooth, quiet, step-by-step action without stubbing. The hexagon binding posts are locked in place so that they cannot work loose when connections are made. All metal parts are nickeled.

The operating knob is Thermoplax like the base. Its sides are gracefully curved and the top polished. The nickeled pointer indicates the amount of resistance in the circuit. An open position on the high resistance end makes a filament control switch unnecessary.

The new rheostat, known as CRL No. 100, can be mounted easily on any panel, the thickness of which does not exceed ½ inch. Its overall diameter is only 2⅛ inches—an important feature because of the limited space usually available.

Merger of Insulate Manufacturers

THE situation in the insulation industry, which has been upset for some time by lawsuits for infringement of the patents covering Bakelite, recently was settled legally by a court decision upholding those patents, and still more recently a business settlement was reached merging the heretofore contesting interests. The General Bakelite Co., whose patent position has been confirmed, has formed a new corporation, the Bakelite Corporation, which combines not only the original Bakelite company, but also the Condensite Company of America and the Redmanol Chemical Products Corporation. These concerns will continue to make and market their products separately, which in many respects possess individual characteristics, though each makes use of the same basic process in manufacture. The new Bakelite Corporation is headed by Dr. L. H. Baekeland.

An Unusual Radio Exhibit

THE Radio Electric Company of Pittsburgh, pioneers in the manufacture and distribution of radio apparatus, shipped an unusual radio display to The Emporium, San Francisco's largest department store, for exhibition in the Shriner's Radio Show early in June. The general direction of this show, held in honor of the Shriner's convention, was in the hands of Mr. Charles S. Mauzy, of The Emporium. A very entertaining program was given daily, which consisted of motion pictures on the action of various radio phenomena, radiophone concerts, orchestra music, aesthetic and fancy dancing.

"Davistone" Horns

HARRY B. DAVIS, of Chicago, has recently perfected a composition known as "Davistone," which, it is stated, is free from vibration and can be used for making phonograph and radio loud speaker horns which do not cause distortion of received speech or music.

A company has been organized to market Davistone for radio loud speakers, phonograph tone chambers and for the many other uses to which it can be put. Davistone horns will be sold in attractive cabinets or mounted on metal bases. They will come equipped with or without receivers. Davistone horns will also be furnished unmounted to firms who desire to assemble their product with these horns at their factory.

Jenkins Vernier Rheostat

J. S. JENKINS, of Chicago, has brought out a Vernier rheostat the principle of which is a resistance wire wound around a solid horn fibre drum in which a screw thread has been cut. The wire lies in the bottom of the cut. Contact is made by a pointer attached to the shaft of the rheostat and, by turning to right or left, the resistance can be lessened or increased as desired, with infinitely small resistance variations.

One of the most attractive features of the rheostat is the fact that instant contact can be made by means of a switch connection which is part of the rheostat. By simply pushing the knob the circuit can be broken, and when the filament current is again required, a pull on the knob connects the circuit and the filament is heated at the same resistance as when the circuit was disconnected.

Westinghouse Type "CX" Indicating Instruments

TO satisfy a demand for high grade small size indicating instruments the Westinghouse Electric & Manufacturing Company has developed and is now producing the new Type "CX" ammeters and voltmeters.

This completes the new line of direct current instruments manufactured by the above company. The line now consists of types BX, CX, DX and SX, having overall dimensions of 2 9/16, 3½, 4⅜ and 7 7/16 inches respectively. All instruments of this X line utilize the same design construction differing only in linear dimensions.

An external zero adjuster on each instrument enables the operator to reset zero position of pointer if it is displaced due to transportation or shock. All parts are mounted on a moulded sub-base, assuring sufficient insulation. The instrument is fastened to the panel by means of three machine screws furnished with the instrument. The standard finish is dull black marine.

The Westinghouse Type CX Voltmeter

The ammeters are self contained for currents up to 30 amperes, but can be used with external shunts for higher currents. The voltmeters are self contained up to 50 volts, but can be supplied for higher voltage with external resistance. The voltmeters have a resistance of 65 ohms per volt in series with the winding. This resistance has a zero temperature co-efficient and can be adjusted to obtain correct calibration.

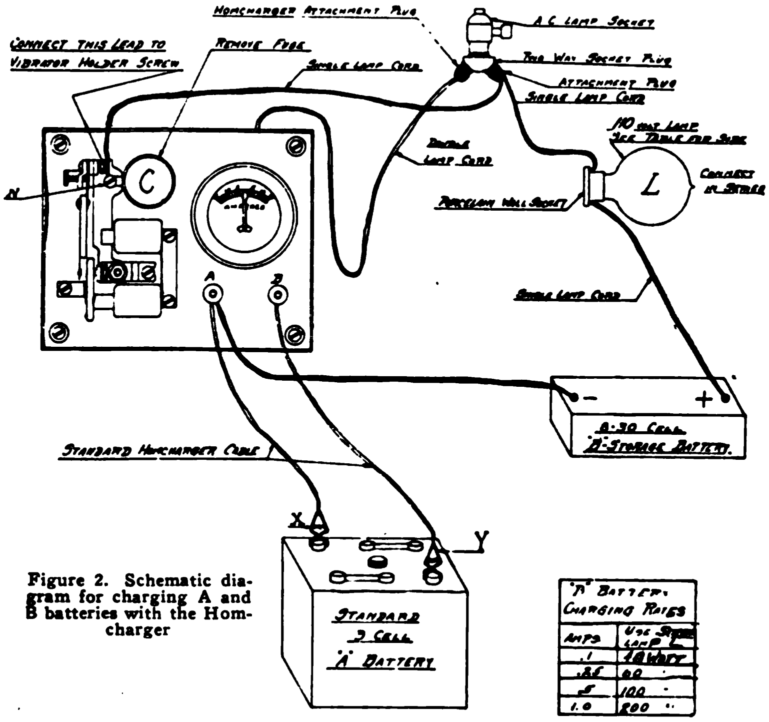
Atwater-Kent Radio Products

THE Atwater Kent Manufacturing Company, of Germantown, Philadelphia, are producing variometers, variocouplers, and audio frequency transformers.

The high repute of this company has been used to good advantage in attaching to the names of the instruments their own name. The circular bases of the variometers and the variocouplers are provided for table mounting, but may easily be removed when the instruments are to be mounted on a panel. The audio frequency transformer has been developed to eliminate distortion of signals. Silent operation of the instrument has also been insured by a metal case which incloses as well as shields the transformer.

Homcharging Radio B Batteries

MINIATURE storage battery cells are being offered by various manufacturers for supplanting the small dry B battery used with vacuum tube receiving sets. These batteries consist of from 8 to 50 small cells, and the recharging of such batteries has presented quite a serious problem to the user and is largely responsible for their not being more readily adopted by the wireless enthusiasts.


Homcharger Attachment Plug
A C Lamp Socket
Connect this lead to Vibrator Holder Screw
Remove Fuse
Single Lamp Cord
Two Way Socket Plug
Attachment Plug
Single Lamp Cord
110 Volt Lamp See Table for Size
Double Lamp Cord
N
C
L
Connect in Series
Porcelain Wall Socket
A
B
Single Lamp Cord
A-30 Cell 'B' Storage Battery
Standard Homcharger Cable
X
Y
Standard 3 Cell 'A' Battery
'B' Battery Charging Rates

Amps	Use Series Lamp L
.1	10 Watt
.25	60 "
.5	100 "
1.0	200 "

Figure 2. Schematic diagram for charging A and B batteries with the Homcharger

These small cells require a very low charging rate, varying from 1/10 to 1 ampere, depending upon their size, but due to the number of cells employed, the charging voltage required is quite high.

Where direct current is available, it is a very easy matter to charge these batteries by connecting same in series with a 40-watt lamp. As 90 per cent of the homes wired with electricity in the United States are supplied with alternating current, the charging of any type of storage battery has presented a much more complicated problem than were direct current available.

Through a very simple scheme of connection it is possible to recharge any radio B battery with a "Homcharger" that is used for charging the A battery. Figure 1 illustrates the connections employed.

The Homcharger fuse C is removed, so as to open the normal charging circuit. One side of the 110-volt alternating current line is connected to the Homcharger armature at N, the other going to the positive terminal of the B battery through a 110-volt lamp-L in series, which acts as a current reducing resistance.

The charging circuit is completed from the negative terminal of the B battery to terminal A of the Homcharger.

The 3-cell 6-volt A battery is connected to the Homcharger terminals A and B in the usual manner. As soon as alternating current supply is turned on the Homcharger armature should start to vibrate and act as a rectifying valve, completing the B battery charging circuit during the proper part of the A. C. cycle, thereby delivering to the B battery a series of intermittent unidirectional current impulses.

It is necessary that either the positive or negative pole of both A and B batteries be connected to the Homcharger terminal A. If this is not done the B battery will discharge instead of charge, the same being indicated by the series lamp-L glowing with intense brilliancy. When connections have been properly made, and the B battery is charging, this lamp burns quite dull.

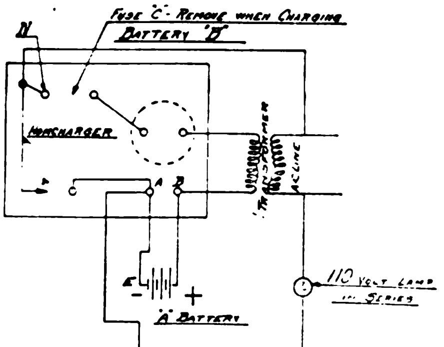


Figure 1. Wiring diagram for A and B battery charging

A very simple method of making the proper connections is shown in figure 2. The material required can be purchased at a cost of less than $2.00 from any electrical dealer.

The two-way socket plug is screwed into the lamp socket and the standard Homcharger attachment plug is screwed into one side thereof. Another attachment plug is inserted in the other side of the current tap, one lead being connected in series with the 110-volt lamp-L of the proper size, the other lead running direct to screw N of the vibrator assembly. The other terminal of lamp-L is connected to the positive terminal of the B battery and the other side of the B battery running to terminal A of the Homcharger.

Fuse C of the Homcharger is then removed, the A battery connected and the lamp socket turned on.

It is impossible to charge both A and B batteries at the same time, as with the fuse C in place the B battery will discharge through the transformer secondary.

The Homcharger ammeter is not connected when the fuse is out, so that it will not indicate the charging rate of the B battery. However, when lamp-L burns dull the batteries are charging properly and no other indication is required.

The Baldwin Radio Company

THE Baldwin Radio Company of Salt Lake City, Utah, with a capital of $1,000,000 has been organized and completely financed. The officers are David A. Smith, President; Lester D. Freed, Vice-President, and J. F. Nibley, Secretary and Treasurer. This company has the license to manufacture the Nathaniel Baldwin radio telephone headset and loud speaker. The new factory of the company will have a daily capacity of 2,000 complete head sets. Through improved methods of manufacture these telephones will be superior in sensitiveness and correct tone reproduction to the very excellent instruments which have heretofore been placed upon the market.

Cutler-Hammer Filament Rheostat

THE Cutler-Hammer Mfg. Company of Milwaukee, Wisconsin, the pioneer rheostat builders, are soon to place on the market their latest development, the C-H vacuum tube rheostat. It will be furnished in two styles, with vernier adjustment for control of detector tubes, or without vernier for control of amplifier tubes. They are designed to carry one ampere and have an operating range of from zero to four ohms. Two amperes may, however, be carried in an emergency.

The Cutler-Hammer rheostat

These new rheostats are built along entirely new lines and incorporate many novel features. A "full off" position is provided, eliminating the necessity of additional switches in the "A" battery circuit. A "full on" position is also provided which makes total battery potential available, rendering charging unnecessary until its full voltage has dropped below tube requirements. A nickeled pointer indicates at all times the amount of resistance in the circuit.

The spring contact fingers are adjustable, and are so mounted as to lie in the direction of travel of the resistor, insuring smooth, quiet, and positive regulation. The large number of turns of low resistance each, cut out or in, one at a time, provides fine gradation of control, minimizing clicking in the receivers during filament adjustment.

The rheostats are designed for panel mounting.

The Monthly Service Bulletin of the NATIONAL AMATEUR WIRELESS ASSOCIATION

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HEADQUARTERS: 326 BROADWAY, NEW YORK

IN a recent order the Naval Department of Canada authorized the use of the 200-meter wave length by amateur radio stations for continuous wave or radio-telephone transmission. Transmission by spark stations is to be done on wave lengths, according to the provisions of the licenses of the individual stations, some of which, particularly in proximity to commercial and government stations, are restricted to wave lengths considerably below 200 meters.

△ △

SHERMAN BROSE has moved from Mason City, Iowa, to 100 East Benton St., Clear Lake, Iowa, and his radio station, call letters, 9DJM, is now located and in operation at the latter address.

△ △

AN appeal for a radio receiving set has been issued by the National Sanatorium of the Knights of Columbus, in Johnson City, Tenn. The hospital cares for a large number of bed-ridden veterans of the World War, whose only contact with the outside world is through visitors and, in the cases of those who can see, newspapers. A radiophone would be a great blessing to these men, as it has proved in other hospitals for veterans, which have been supplied by local donors.

△ △

MAYOR CALDWELL of Seattle, Wash., proclaimed the week of June 5th to 10th as "Radio Week," when a radio show was put on by the Seattle Radio Association and Totem Radio Club, at Dreamland Pavilion, 7th and Union Streets, in this city.

The Seattle Radio Association was organized for the purpose of promoting the cause of radio in all useful channels, and its sphere of influence will be bounded by Oregon, Idaho and British Columbia. It is a nonprofit making organization.

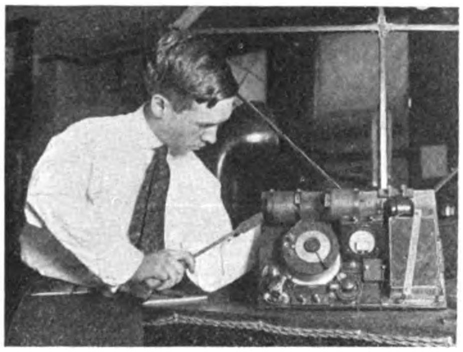
△ △

THE National Radio Club has been organized at Pittsburgh, Pa. The intentions of its organizers are to weld the nation's army of radio enthusiasts into one compact body.

The club's fundamental purposes are to promote and finance the installation of radio equipment in hospitals; keep all members informed regarding developments, improvements and news of interest regarding radio; answer, without charge, all technical questions asked by members; receive and file articles written by members for reference; lend the moral support and influence of the club to those agencies that are endeavoring to eliminate the confusion of signals; promote fraternity and good fellowship among members with the aid of a distinctive official button and card of membership.

The organization committee includes Harold B. Coe of New York City, Charles W. Payne of Philadelphia, F. R. McCray of Los Angeles, Otto J. Palm of Cincinnati, R. Gordon Craig, Ray Mansmann and Francis G. Albertson of Pittsburgh, all radio enthusiasts who are sparing no effort to promote the interests of radio transmission.

The National Radio Club has been assured the hearty co-operation of the large manufacturers, but will maintain a strictly neutral attitude in all matters of equipment, and its officers and directors will be selected from radio enthusiasts not engaged in making or selling radio apparatus. A nominal membership fee of two dollars will be charged applicants. Interested persons can get in touch with the club by writing to Francis G. Albertson, Secretary, 419 Fulton Bldg., Pittsburgh, Pa.



Edward T. Dickey operating a 50-meter transmitter

△ △

THE fame of John Grinan (pre-war 2 P M) has even penetrated to the far corners of Missouri. The Kansas City, Mo., *Star,* recently printed a partial story of his life and described his long and interesting career in radio. If they believe it in Missouri it must be so.

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ALL those interested in radio, attended a meeting of the Fort Worth, Texas, Radio club meeting place 611½ Houston St.

The radio situation, particularly in regard to broadcasters, amateurs, and those with receiving sets was explained and discussed. An efficient receiving set has been installed at club headquarters and half-hour radio concerts given, with the set adjusted to eliminate all possible noises and interference.

About 40 members attended the meeting. Four new members were received, W. E. Branch and G. C. Rulison, technicians, and G. C. Arnoux, all of *The Star-Telegram* radio staff, and Bert Barber of the H. C. Meacham radio department.

B. H. Parker was added to the theory committee of the organization, appointed by President O. R. Garrett.

△ △

THE Portsmouth Radio Association, in a meeting held on June 13 adopted unanimously the by-laws reported by a committee named several weeks before.

A booster committee with S. J. Seckelman as chairman was appointed by the club.

There were several lectures delivered before the meeting, all of them having to do with radio work. Among them, was an address by W. D. Daniels, chief electrician of the U. S. S. *Langley,* who talked on the subject of electrons in connection with wireless work.

It is the intention of the club to have other lectures, all of them dealing with elementary electricity. There are a number of persons interested in wireless work, who are anxious, it was stated, to gain the benefits to be derived from lectures of this sort.

W. J. Rogers was elected assistant secretary of the association in the meeting, and was also placed in charge of the club's publicity program.

△ △

THE Cleveland Radio Association, directors have a celebrated receiving set to keep tab on amateurs who interfere with broadcasting concerts.

△ △

A REGULAR meeting of the Atlanta Radio club was held in the club rooms, on the fifth floor of The Journal building on June 10. F. S. Bernhard, radio engineer of the Western Electric Company, who is directing the installation of The Journal's new broadcasting station, gave an interesting talk on the construction and operation of the new station. He also described broadcasting stations in various parts of the country.

Radio Engineer G. A. Iler, of station WSB, told of his recent visit to Radio Central, Port Jefferson, Long Island, N. Y., the largest radio transmitting station in the world.

It was unanimously voted that the Atlanta Radio Club should co-operate with the radio clubs now being organized by the Junior Chamber of Commerce, the two clubs to preserve their separate identities, but work together for mutual benefit and advancement. Committees have been appointed to work out various details of the plan for co-operation. Harry Dobbs, president of the Atlanta Radio Club, presided at the meeting.

△ △

ABOUT seventy-five members of the Tri-County Radio Club attended the first annual outing of that organization on June 5, at Westhampton, Va., and enjoyed a novel entertainment program that included radio concerts, tricks by two magicians, refreshments and other features. From 7:30 until 10:30 o'clock the party was a series of one stunt after another, given on the lawn at John B. Swartwout's home.

High amplification beyond the dreams of many members of the club was demonstrated, when the radio concerts passing through the air were picked up and reproduced by a loud-speaker horn so that they could be heard a quarter of a mile away. A standard short-wave regenerative set and two-step amplifier, supplemented by a new three-step power amplifier and loud-talker that is just being placed on the market was used.

Another interesting display was the universal receiver, built by Mr. Swartwout, on which almost any combination can be worked. The set includes a short-wave regenerator, honeycomb coil section for all waves, with two stages of radio frequency, two stages of audio frequency and power amplification.

The outing was so successful that steps probably will be taken at the next meeting of the club to make it a permanent annual event.

△ △

THE Eastern High School Radio club and the science classes were given an unusual treat recently by C. Francis Jenkins, local inventor, who explained how he had successfully sent moving pictures by radio at a recent test of his new invention. The lecture was delivered in the physics lecture room of the school, the genial little Scotchman being introduced by Henry Flury, the livewire instructor of physics and faculty adviser for the Radio club at the Capitol Hill institution. Mr. Jenkins talked in terms that all could understand and intense interest was displayed by the budding radio fans.

The inventor showed how the variation in light would affect the electric resistance of selenium and a corresponding variation in the current be produced. "Selenium, however, is too slow in its action and another substance more sensitive is used," declared Mr. Jenkins.

"On the receiving end of the line is an apparatus with a sensitive detector much like the radio vacuum tube which picks up the electric waves. These are passed through a polarizer and an analyzer surrounded by a magnetic field. The analyzer reconverts the electric variations into light variations and flashes a picture on the screen," was the explanation of the method of broadcasting pictures given by the inventor.

At the conclusion of the talk Mr. Jenkins answered a number of questions and said he would receive the club a few days later at his laboratory and demonstrate the apparatus. His offer was immediately accepted.

The school radio set, which consists of a two-step vacuum tube amplifier, was fitted up during the past week by the members of the club under the direction of G. Murray Clay.

△ △

JOSEPH LIMONE, of East Boston, Mass., has constructed a receiving set that is claimed to be the smallest receiver in existence that really works. It is 3 inches long, 2 inches wide and 1½ inches high and receives stations within a 50-mile radius.

△ △

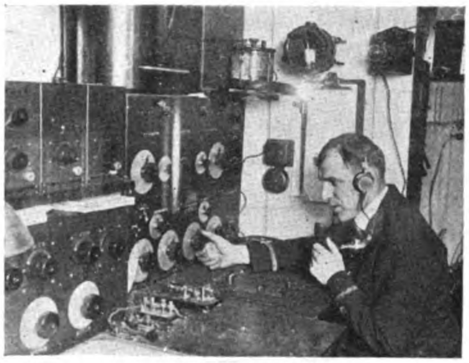
MISS ABBE P. MORRISON, of New York City, President of the Women's Radio Club of America, is spending the Summer in Europe and is endeavoring while there to co-ordinate the activities of the amateurs of several foreign countries with those of the United States. Miss Morrison will visit England, France and Holland.

△ △

CARROLL V. KING, a radio amateur of Oakland, Cal., and Miss Lorraine Howard, of Berkeley, were married recently and the music for the affair, including the wedding march was broadcasted from a nearby station and made audible to the wedding party by a loud speaker.

△ △

THOMAS J. WEST, of Wheatley Hills, L. I., 100 years of age, claims the distinction of being the oldest radio amateur in the world. While celebrating his one hundredth birthday recently, at his home, he was visited by his son, Edward B. West of Brooklyn, seventy-four years of age, and his niece, Margaret Atwater, 82 years of age.



Operator F. E. Black aboard the S.S. America talking to Washington

A MEETING was held in the Daniel Boone Tavern in Columbia, Mo., recently, by representatives of the radio organizations of the state to perfect a state-wide organization. Dr. Klenk represented the St. Louis Radio Association at the meeting.

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TWO boys of New York City recently let their desire for radio equipment overcome their scruples as to how of where they got it and as a result were brought up in court on charges of having stolen $2,000 worth of new radio equipment from a factory. The parents of the boys, however, returned the stolen equipment intact and the judge severely lectured the boys and let them go.

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THE radio station of the College of the City of New York Radio Club is located at the top of the Bell Tower in the main building of the College, 139th st. and Amsterdam ave., New York. This room was used during the war by the U. S. Navy as a Radio Compass Station and a depot for the detection of enemy wireless stations. Through the kindness of Professors Fox, Turner and Hubert, and the Club's Faculty Advisor, Prof. A. N. Goldsmith, the historic room was turned over to the Radio Club for their exclusive use, night and day.

From the radio station a stairway leads to the roof where one will find observation seats and stone tables. The loop aerial used by the Navy was located on this roof and it is being restored under the direction of Chief Operator Carlisle as a memento of the war. A regulation 200-meter aerial stretches between the two small towers of the main building—one of which is the Bell Tower—and a 2-wire receiving aerial, about 150 feet long is stretched from the main tower.

The Club was addressed recently by Professor Alfred N. Goldsmith, head of the Research Dept. of the Radio Corporation of America and Professor of Electrical Engineering at the College. The Professor traced the development of radio telephony from its feeble beginnings in 1903 and thereabouts, following with a discussion of what will be done in the near future in regard to ship to shore telephony, saying that it would soon be possible for a man to call up from his home, another man in his cabin on a steamship.

The club has recently completed the erection of a three-wire antenna 160 feet high.

In the election of officers for next fall the following were elected: Richard Carlisle, formerly chief operator, was elected president; Lymen Barry was elected vice-president; and David Weinbloom, secretary-treasurer.

△ △

THE Southern Illinois Radio Association has decided to hold regular meetings every Tuesday night. The Association is to buy a complete practice set with which the code can be taught. It is the aim of the club to teach all the different subjects of radio. The officers of the club are: Monroe Sisney, president; Carry Davis, vice-president; T. L. Bryant, secretary-treasurer; William Felts, recording-secretary.

△ △

SEVERAL hundred delegates attended the first annual convention of the amateur operators of the Seventh Radio District in Seattle on June 10, many coming from Portland, Salem, Eugene, Vancouver, B. C. Pullman and Wenatchee, as well as from Seattle.

Uniformity in traffic rules, so that all amateur radio operators of the Northwest may make the most of their opportunities without interfering to any great extent with the work of broadcasting stations and the like was discussed.

The plans of the originators of the convention provide that resolutions are to be adopted setting forth, for the benefit of the federal government, recommendations for rules and regulations that will conserve the interests of the amateur radio telegrapher.

The assembling of the convention is in the hands of the Totem Radio Club of Seattle, which sent out invitations to 20 amateur radio clubs and associations in Washington, Oregon, Montana, Idaho and British Columbia, the last named being taken into the fold as a complimentary measure. British Columbia stations are just as much interested in having assigned hours for their radio telegraphy entering into the scheme of the whole Pacific Northwest as are those who reside in the states.

△ △

DURING the period of the membership contest of the New Haven, Conn., Radio Club 23 new members were brought into the club which brings the total membership up to about 150 active members. Fred Brill of 242 Davenport ave., brought in six new members and was awarded the prize, a UV200 tube. The club's secretary, Wilmott, was second with two members, and 12 people brought in one each.

The new three-step amplifier which Martino and Barnum have just built for the club is giving good service. According to Martino all that the club now needs is a good aerial, so that the broadcasting stations can be heard with ease.

The finances of the club took a big jump during the week, and it looks as though it would be smooth sailing hereafter.

It has been decided to keep the club going during the summer, and to lease the present meeting place (Fraternal Hall) until the Fall. The overwhelming majority in favor of this action indicates that radio will be a live issue during the hot weather. Mr. Butler promises good entertainment at their Summer meetings.

Walter A. Rida, who has been vice-president of the club tendered his resignation, due to the pressure of business. S. Martino, 1AWB, will take his place.

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THE new apparatus of the Washington, D. C., Radio Club of Central High School has arrived. A T-type cage aerial with a cage lead-in, has been constructed and the ground system changed. This aerial is similar to the one used in one of the most successful trans-Atlantic amateur stations.

Two complete transmitting sets have been installed and a third will be completed as soon as possible. The first set is a ten-watt self-rectifying continuous wave transmitter and is composed of school apparatus. The other set is a twenty-watt radiophone. The major part of this set has been constructed by the members, although several parts were purchased with money from the club fund and President Dewhirst furnished the high voltage generator for the plate supply. A tube rectifier for changing high voltage alternating current from a transformer to direct current will be made as soon as the remaining apparatus arrives.

△ △

MEMBERS of the New Orleans Radio Association opened new headquarters for the club at 620 Baronne street on June 2 in a rousing fashion. About 100 members and friends were present and thoroughly enjoyed the program. It was one of the liveliest and most successful meetings in the history of the club.

"There is nothing standing in the way of our progress," President J. A. Bowling said. "We have been delayed getting started on account of not being in permanent quarters, but now that we are established, we hope to go ahead on a scale that will improve the association.

"The New Orleans Radio Association stands for radio development. It was organized to promote local interest in the new use of the air. Most of the members are amateurs with considerable experience. Many of the members hold commercial licenses. So, taken as a whole, the membership is experienced in radio and its problems.

"We hope amateurs who are just getting into the game will take an interest in the New Orleans Radio Association, and will join. There is plenty of work to be done and with proper support from all interested we should accomplish great things.

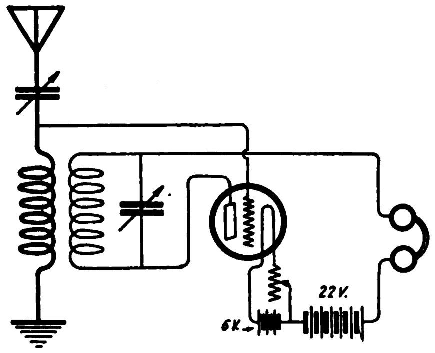
"A complete receiving set will be installed in the near future. It will be the latest thing in receiving apparatus. We expect to work out an arrangement that will give us a competent operator on duty at all times. This will allow beginners and others to visit the headquarters day and night and 'listen in' to programs being broadcasted by local stations and others.

"A cordial invitation is extended to anyone interested in radio to join the association. Meetings are held the first and third Friday every month."

△ △

A UNITED STATES Civil Service examination to fill a position as Junior Radio Engineer will be held August 9. The vacancy is at Camp Alfred Vail, N. J., the famous Signal Corps camp, and pays $1,700 a year. Applicants must be graduates of a college, or senior students, and have studied electrical engineering. The subjects of the examination will include physics, mathematics through calculus, practical questions on radio engineering, and education, training and experience.

△ △



David W. Cobb, of Hanover, N. H., has been getting the broadcasting programs every night with this simple circuit

△ △

FORTUNATO Crino, fifteen years old, and Almond Didomendo, eleven, both of No. 2403 Hoffman street, the Bronx, were arrested after they and five other boys, according to the police, burglarized the radio store of Samuel Paur, No. 2111 Southern Boulevard, the Bronx, New York City.

Patrolman Condon and Hunter of the Bathgate avenue station, noticed the group of boys carrying radio apparatus. They took to their heels when they saw the patrolman. The two prisoners told the police that the "gang" had decided to build a radio station in their headquarters in a nearby shack.

△ △

The Radio Neighborhood

By Clarence E. Flynn

While we have struggled patiently
Toward the larger good,
Friendship on every land and sea,
A world-wide neighborhood,
Space set its limits everywhere,
Its hedging curtains swirled;
But now we speed o'er land, through air,
And talk around the world.

Who is our neighbor? Yesterday
It was the man whose home
Was down the road or o'er the way
Where we might often come.
Today the golden tie that binds
Men's souls in joy or care,
The word uniting hearts and minds,
Is vibrant everywhere.

Have You Met Him?

By George F. Patrick

HAVE you met the guy who knows just why your tube won't oscillate, who ridicules the things you do to change its dormant state. He has the dope, this new white hope, but you are off the track, the stuff they print don't give a hint, of what your outfit lacks. He's found out that experts, inventors and all such, though they have the reputations, just do not amount to much, they write a lot of verdant bull, to try and hide the stuff, that he has gotten wise to, they try to make you muff. Is your radiation smaller that you think you ought to get, he knows what's wrong there too, although he's never seen your set. Just listen while he tells you, of the things that he can do, and the wonders of his outfit, all stuff that's strictly new. It's not your gap, that's wrong you know, that don't cut any ice; antenna, ground, spark frequency? No. no, don't think about them twice; its something new that he has got, right off the bat and sizzling hot, and some day he will show them all, that they have missed a lot. Do you use your batteries carefully and treat them every day? What a nut you are to waste your time, he knows an easier way. Don't argue that you think the makers ought to know their stuff; he knows they're wrong, this prodigy, and he has called their bluff. Has your set been heard a thousand miles, and do you think that's fine? Just hear him snort in great disdain, you're way behind his time. A thousand miles is practice for him most every day, and when he's out for distance, he just makes the ether sway. You hear him rave about the hams, that clutter up his way. They don't know how to telegraph; their trade is making hay. They send too slow; they do not space; he shows them up most every place. He has to put their business through; they cannot hear a thing, and if they should they could not read. It surely is a sin, to give such ones a license that reads the same as his; they're good for naught but QRM, to hamper others biz; not that the QRM hurts him. Oh no, he has that fixed; he cuts it out entirely, no matter how it's mixed. Do you want to try CW? He'll give you all the dope; don't bother reading magazines, they only make you grope; just listen while he tells you of the things that he can do, with one small bulb, a few old cells, a tuning coil or two. The radio compass stations are bunk; he's found that out, although there's something in it, and some day he'll put them right; it's surprising that the government with all the wealth at hand, can't do the things that he would do, were he in high command. And so it goes all down the line; if you stand round to hear, this wonder is the only one that's working in high gear. You gaze at him with mouth agape; you marvel at the things he states. He must be some inventor grand, who's known in every clime and land. Have you met this guy? Who knows just why, if not I'll put you wise. He's the Past Exalted Master of Amalgamated Liars, he holds the proud position of a steamship second op; he holds it, but he's slipping, and he probably will drop, for his chief in every single case that I have come across, says he's worthless and a shirker, and his brains a total loss, so when you meet him brothers, just pat him on the back, and tell him "Say no more old pal, I've got your number Jack."

STATIONS WORKED AND HEARD

Stations worked should be enclosed in brackets. All monthly lists of distant stations worked and heard which are received by the 10th of each month will be published in the next month's issue. For example, lists received by November 10th will be published in the December issue. Spark and C. W. stations should be arranged in separate groups.

1-BAS, Paul S. Hill, Jr., Saco, Maine, (May and June.)

C. W.—(1aq), (1adl), 1agi, 1ajp, (1akg), 1aun, (1awb), 1awo, (1azd), (1azw), 1bbw, (1bcf), (1bdi), (1bdv), 1bep, (1bes), 1bet, 1bgf, 1bhi, 1bht, 1bka fone, (1bkq), (1bln), 1blx, 1bnt, (1bqe), (1bvr), 1cal, 1cbp, 1ccz, 1cdo, (1cfi), (1cgs), (1chj), (1cit), 1cja, 1cla, (1cmk), 1cne, 1cnt, (1cra), 1csm, 1cve, 1cm, 1dh, (1ee), (1es), 1fw, 1hk, 1hx, 1ii, 1iv, 1on, 1pr, 1qp, 1rd, (1rh), 1sg, (1ul), 1xz, (1yb), (2afp), 2agb, 2anm, 2aws, 2axk, 2bg, 2bai, 2bbb, (2bdg), (2beh), 2bes, 2bfx, 2blp, 2bmc fone, 2bme, 2bnz, 2bqd, 2bqh, 2brb, 2brc, (2btj), (2cbg), 2cbt, 2ccd, (2ces), (2fp), 2kl, 2nz, 2wr, 3aay, (3acz), 3ais, (3ajd), 3aln, 3ask, 3bfu, 3blf, (3bnu), 3dt, 3fp, (3no), 3qn, 3qp, (3vw), 3wf, 3zo, (3zz), 4dc, 4gl, 4gx, 8an, 8adg, 8adn, 8amm, (8aqo), 8avd, (8awp), 8bo, (8bil), 8bke, 8blx, 8cbs, 8cjh, 8ckm, 8cko, (8qc), 8qk, 8se, (8tb), 8ue, 8uk, 8vy, 8zq, 9al.

Spark.—(1aa), 1aw, (1aco), 1acu, (1adc), (1akg), 1aok, (1bcf), 1bjs, 1boe, 1boq, (1bpz), (1brq), (1bto), (1bub), (1bzn), (1cl), 1caj, (1cgu), (1cib), (1crt), (1fm), 1kv, 1or, 1rv, (1rx), 1sc, 2bfs, 2bme, 2dn, 2fp, 2om, 2rm, 2tf, 2ts, 3bvc, 3gx, (3ta), 4ea, 8bah, 8zq.

1-ACU, Preston D. Baldwin, Groton Long Point, Conn. (June)

C. W.—(1es), 1hk, 1hx, (1iv), (1oz), (1pr), (1agh), 1anq, (1asf), 1ayz, 1azd, (1bkp), (1bqe), (1ccz), (1cne), (1cpz) 1cre, 1cve, (2bg), (2hj), 2hv, (2nz), (2ry), 2ts, (2vh), 2wb, 2abs), 2acd, (2ajf), 2aql, (2ayf), (2ayv), 2bdg, (2bdu), 2bem, 2bfz, 2bji, 2aog, (2blp), (2bml), (2bqh), (2bqu), (2brb), (2brc), (2btw), 2bum, (2byc), (2cbg), 2ccd, 2ccu, (2cdk), (2cei), (2ces), 2cim, 2crv, 2cwe, (3as), 3bg, 3cc, 3fr, 3fs, 3iw, 3ta, 3adx, 3bfu, 3bhl, 3blf, 3bnu, 3cbm, 4bq, 4by, 4dc, 4lp, 8an, 8kl, 8mp, (8oy), 8uc, 8uk, 8vq, 8acf, 8aim, 8amm.

C. W.—8avd, 8avl, 8avt, (8bdb), 8bpo, 8deo, 8bke, 8blx, 8brw, 8cay, 8cbj, 8 cjh, 8ckm, 8cko, 9hw, 9io, 9vv, 9bed, 9bhd, 9bsg.

Spark.—1boe, (2cy), 2fp, 2di, 2om, 2rm, (2abm), 3fp, 3bfu, 8bn, 8ew, 8jl, 8baz, 8cig, 9cp.

Can.—9al.

Prize Contest Announcement

The subject for the new prize contest of our year-round series is:

RECEIVER RADIATION PROBLEM

CLOSING DATE :: :: SEPT. 1, 1922

Contestants are requested to submit articles at the earliest practical date. Prize winning articles will appear in the November, 1922 issue.

All manuscripts should be addressed to the CONTEST EDITOR OF THE WIRELESS AGE.

THE increasing use of regeneration in broadcast receiving sets is causing considerable difficulty in reception because of the radiation of energy by many of the regenerative receiving circuits now in use, especially when several are located in close proximity. How can this be avoided? For suggestions, see Ralph R. Batcher's article on page 76 of this issue.

PRIZE CONTEST CONDITIONS—Manuscripts on the subject announced above are judged by the Editors of THE WIRELESS AGE from the viewpoint of the ingeniousness of the idea presented, its practicability and general utility, originality and clearness in description. Literary ability is not needed, but neatness in manuscript and drawing is taken into account. Finished drawings are not required, sketches will do. Contest is open to everybody. The closing date is given in the above announcement. THE WIRELESS AGE will award the following prizes: First Prize, $10.00; Second Prize, $5.00; Third Prize, $3.00, *in addition to the regular space rate paid for technical articles.*

Handy Hints

Grid leaks and grid condensers cannot be used in connection with the crystal receiver.

A crystal set cannot be made to regenerate.

The wave length has little to do with the distance received.

Low resistance (75 ohm) city telephone receivers do not respond to weak signals and cannot be used for radio reception.

Two or more receiving sets cannot be connected to the same aerial, and receive at the same time.

A crystal detector, as well as a vacuum tube detector, can be amplified to almost any degree.

Do not burn the filament of a tube too brightly just to strengthen signals; it will shorten the life of the tube.

It is often better to buy a few accessories than to build them.

Do not expect too much from a home-made set.

Do not use water from the faucet in a storage battery.

Keep a rubber mat under the storage battery so that acid will not get on the floor.

The positive pole of the storage battery generally sulphates first around the top of the case. Keep this terminal clean.

Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of one reader can be answered in the same issue. To receive attention these rules must be rigidly observed.

Positively no questions answered by mail.

G. J. W., Jr, Chicago, Ill.

Q. 1. Which is the best type of variometer? a. wood; b. bakelite; c. lattice-wound or basket-ball.

A. 1. Bakelite or lattice-wound variometers are to be preferred to wood, as wood has a tendency to warp and injure the windings.

Q. 2. Does a tickler coil give greater regeneration and sharper tuning than a variometer in the plate circuit?

A. 2. A tickler coil does not give any greater regeneration than a variometer in the plate circuit.

Q. 3. Give the constructional details—size of primary tube, rotor and wire, number of taps and where placed—of a vario-coupler and tickler coil—if better than plate variometer—variable if better, that will receive up to six hundred meters.

A. 3. This set has been thoroughly covered in previous issues of The Wireless Age. Several good circuits of this type are shown, for instance, in the June issue of The Wireless Age.

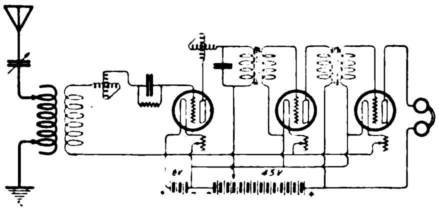
Q. 4. Give hook-up for a five-watt C.W. set, using 110 volts A. C. for voltage source.

A. 4. See figure 3, page 13, of the Radio Corporation's catalog, for complete circuit diagram of a 5-watt, full-wave rectification set.

Q. 5. Can I use a land telegraph key in set described in No. 4?

A. 5. A land line telegraph key may be used for radio signalling for sets of low power.

* * *



Charles A Clark, New York City.

A. 1. You can build a short wave regenerative receiver with the equipment you have on hand, by assembling it as shown in the above diagram. As we presume you will understand the assembly from the diagram, we have not numbered or named the various parts.

* * *

Joshua Shapiro, Brooklyn, N. Y.

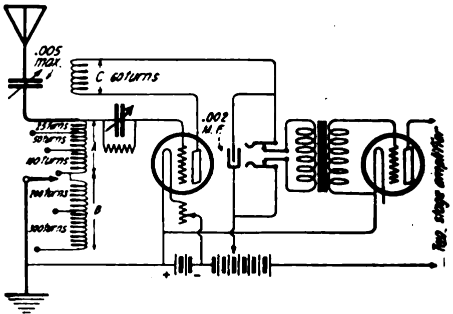
Q. 1. Could you please give me the hook-up of a transformer for a vacuum tube set using 6 volts for A, and 22 volts for B, for detector, 6 volts for A, 95 volts for first two stages of amplification, and 150 to 200 for third stage of amplification.

A. 1. We do not recommend use of alternating current for plate voltage as it is a complicated job and requires apparatus which would be infinitely more expensive than "B" batteries. Besides it is exceedingly difficult to filter and balance out all the A. C. hum, a considerable amount of it always being present. In fact it would probably be much louder than the music you desire to receive. However it is possible to use A. C. for lighting your filaments of the detector and amplifier tubes but even then the hum would be quite bad and would seriously interfere with proper broadcast reception. In the long run it is best to use a storage battery for filament and "B" battery for the plate. If you desire to use A. C. for filament lighting, consult the articles that have appeared in The Wireless Age, March 1922, pages 38 to 40.

* * *

H. G. Hubbard College View, Neb.

Q. 1. In the June 1922 number of The Wireless Age, page 71, is shown a hook-up which took second prize and was won by Paul M. Wright. It is claimed that the range of this hook-up is up to 3,000 meters, but I cannot see how this is possible from drawings.



A. 1. (Diagram.) Coils A and B are both wound on the same bakelite tube 2½ inches diameter by 5 inches long. Coil A is a single layer, containing 100 turns, with taps at 25, 50 and 100 turns. Coil B is a 2-bank winding, connected in series, containing 200 turns additional, with a tap at the midpoint. No. 10/38 litzendraht, or No. 28 S.S. copper wire may be used. Coil C which rotates inside of coil A, is used as the tickler. It contains 60 turns of No. 28, S.S.C. wire wound on a tube 1⅞ inch diameter by 1¼ inch wide. An ordinary variocoupler may be used instead of coils A and C, but it may be necessary to add more turns to the secondary in order to get sufficient tickler coupling at the longer waves.

KENNEDY EQUIPMENT

KENNEDY EQUIPMENT

Type 220
Intermediate-Wave
Regenerative
Receiver
With Type 525
Two-stage
Amplifier

All Kennedy
Regenerative
Receivers
are Licensed
under
Armstrong U. S.
Patent No.1,113,149

KENNEDY

Intermediate-Wave Regenerative Receiver Type 220

Maximum effectiveness with a high degree of selectivity on all wave lengths within its tuning range of 175 to 3100 meters is assured by the design of Kennedy Receiver Type 220.

This receiver is made for those who want highly efficient reception over a range of wave lengths somewhat more comprehensive than that provided by the ordinary short-wave instrument.

In its design full use has been made of the accepted principles of the best radio engineering practice. This has resulted in a highly selective receiver of maximum effectiveness.

Type 220 receiver has proven very popular for the reception of radio amusement, educational features, news and market and weather reports.

Kennedy Radio Equipment is Sold by Good Dealers Everywhere

Write for Latest Bulletin C-3

The Colin B. Kennedy Company
INCORPORATED
RIALTO BUILDING SAN FRANCISCO

The grid condenser should be variable in order to compass such a range of wave lengths effectively. When using a Radiotron U. V. 201 as a detector, there is quite an advantage in connecting the grid leak between the grid and the positive leg of the filament, inasmuch as you can get substantially the same signal with very much dimmer filament. However, this is really equivalent to connecting the ground side of the receiver to the positive filament instead of the negative filament. A blocking condenser of .002 mfd. should be used across the primary of the first transformer to act as a by-pass for the radio frequency.

* * *

L. A. B., Baltimore, Md.

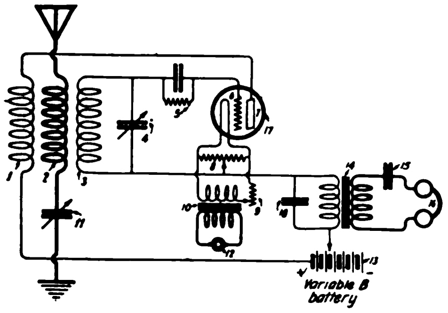
Your diagram is correct, except that condenser 18 should be connected across the primary of 14. Condenser 15 should be of at least .002 mfd. capacity—see The Wireless Age for March, 1922.

Q. 1. What type, make, price, etc., for instruments 8, 10 and 14?

A. 1. The following are the type numbers and approximate prices of the items referred to. Number 8 Radio Corporation potentiometer PR 536—$2.00. Number 10 GE bell ringing transformer Number 179541—$4.00. Number 14 General radio telephone transmitter, type 166,—$9.00.

Q. 2. Can instruments 10 and 14 be easily made? If so, how?

A. 2. Item Number 10 can be made quite readily, as shown in the following diagram.



1—Tickler coil
2—Primary coil
3—Secondary coil
} Spider-web type. Several different sizes can be plugged in.
4—23 plate variable condenser. 5—Grid leak and condenser. 6—Grid of tube. 7—Plate of tube. 8—1000 ohm potentiometer. 9—Rheostat for filament. 10—110 v. to 6 v. transformer. 11—43 plate variable condenser. 12—Socket for plug to house lighting circuit. 13—B battery—22½ volts. 14—Transformer. 15—Fixed condenser 0.0002 mfd. 16—3000 ohm phones. 17—Detector vacuum tube and socket. 18—Fixed condenser 0.0005 mfd.

Primary having 110 volts of Number 20 DCC wire. Secondary 10 turns Number 16 DCC wire. Item 14 should be purchased complete, but if desired one can be made by using a core of an amplifying transformer. Primary should contain 2500 turns Number 36 SSC wire, and the secondary 1000 turns of the same size wire.

Q. 3. What would be the approximate dimensions of a loading coil to enable this set to hear Arlington time signals? Is this coil put in series with aerial circuit?

A. 3. In order to hear Arlington, NAA, it would be necessary to load both primary and secondary circuits with coils of approximately 400 or 500 turns.

* * *

T. G. W., Jr., Chicago, Ill.

Q. 1. Is radio-frequency amplification superior to audio-frequency? Is transformer coupled amplification better than resistance coupled amplification?

A. 1. Radio-frequency amplification should be used if it is desired, to receive distant stations. If it is desired to use a loud speaker in receiving nearby stations, audio-frequency amplification is better. Transformer coupling is recommended in both cases.

Q. 2. In a four-step amplifier, which of the following combinations will give the best results? (a) Four steps of radio-frequency. (b) Three steps radio and one of audio. (c) Two of each. (d) Three steps of audio and one of radio or (e) four steps of audio-frequency amplification.

A. 2. The best combination of radio and audio-frequency is two steps radio, one detector and one step of audio.

Q. 3. What is the best circuit for amplification—heterodyne, superheterodyne, etc.?

A. 3. See the July 1922 issue of The Wireless Age.

Q. 4. Kindly publish the best short-wave regenerative hook-up, using the combination given in question one or two for coupling and number three for circuit and one vario-coupler, two variometers, and variable condensers for tuning and a tickler for regeneration.

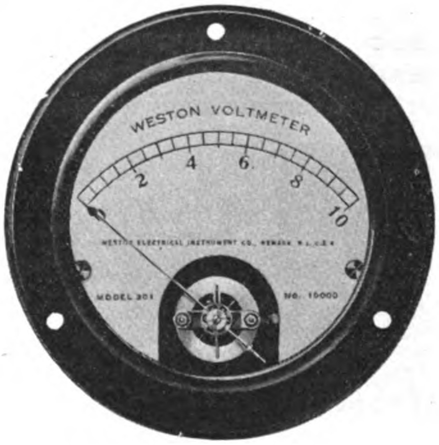
A. 4. The July issue also contains several complete diagrams of combined radio and audio-frequency. See answer to Charles A. Clark for wiring of regenerative receiver, using grid and plate variometers. Long waves can be regenerated as well as short waves by use of coils of the proper size. Tickler coils should be coupled to the secondary and short-wave variometers may be left in the circuit even on the longer waves.

Why Should I Use a

Weston

Filament Voltmeter

On My Receiving Set?



Model 301

Here's the Answer:

1. It simplifies tuning by eliminating guesswork as to tube adjustments;
2. Filament voltage control increases the life of the tube from two to three times;
3. The Weston Filament Voltmeter is accurate and can be relied upon for duplication of results.

All this means

Better Reception!

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"Stop those back fence concerts"

THE yowls of a prowling Tommy are as mere love-songs beside the ear-splitting howls of a perturbed radio set (and you'll be surprised how often one gets perturbed without the calming influence of the proper Amplifying Transformer).

Most any transformer can amplify sound, but it will also amplify the stray fields which produce howling and distortion. It takes the Acme Amplifying Transformer with its specially constructed iron core and coil to put an end to the "back-fence" concerts. Only when you add the Acme do you get the realistic tone and volume so markedly absent in the ordinary radio receiving set.

The Acme Radio Frequency Transformer greatly increases the range of any receiving set, either vacuum tube or crystal detector type. The Acme Audio Frequency Transformer produces not only volume, but reality of tone. It is indispensable to the satisfactory operation of loud speaking devices. The combination of one or more stages of Acme Radio and Audio Frequency Transformers assures the maximum of range, of volume and of reality in tone.

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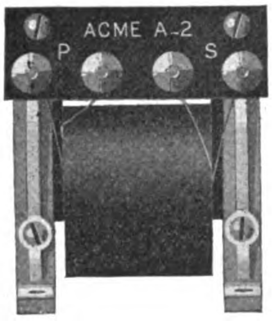

Type A-2 Acme Amplifying Transformer

Price $5
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ACME
for amplification

Review of New Radio Books

J. O. Smith (2ZL) Writes the Book of the Year

WHAT is destined to be the foremost radio book of the year has just been written by J. O. Smith, the internationally-known amateur, who, as 2ZL, has won fame by his feats with continuous wave transmission. Those who have been privileged to see the advance proofs of the new volume, which is now ready for distribution, have discovered it to be a very comprehensive survey of modern tube receivers and transmitters, and thoroughly up to date.

The book, which is called "Modern Radio Operation," has been carefully written to interest the average man who is just beginning to take notice of radio, while the more advanced chapters, to which the early chapters lead in logical fashion, contain many details and data that the most experienced amateurs will find new, novel and exclusive. In the opening pages Mr. Smith gives a simple outline of the principles upon which radio communication is based, and includes illustrations and details of the principal broadcasting stations, with several of which he has been connected in an operating or advisory capacity. He then takes up the design and operation of vacuum tube receiving sets and transmitters. There is a particularly forceful and impressive analysis of the comparative merits of spark and continuous wave transmission, illustrated with facts drawn from Smith's long experience in working with other amateurs using all types of transmitters.

Complete details are given of the equipment at 2ZL, with which trans-Atlantic and trans-continental work has been done, and a number of other prominent amateur stations are described. The text contains many illustrations, including, of course, complete diagrams of all types of transmitting and receiving circuits. The newest circuit in receiving apparatus, the Armstrong super-regenerative system, is here presented for the first time within the covers of a book. The volume closes with many exceedingly valuable operating hints, some of which will be new to all except the comparative few who have been privileged to know Mr. Smith personally. The equivalent of that privilege now is open to all through his new book, which should be in the hands of everyone interested in radio.

Modern Radio Operation, by J. O. Smith. New York, 1922, The Wireless Press, 326 Broadway, New York City. 144 pages, cloth bound, price $1.50.

Receiving Tube Elementals

THE vacuum tube appears to the layman as a complicated form of incandescent bulb that operates in an entirely mysterious manner; E. H. Lewis in his book, "The ABC of Vacuum Tubes in Radio Reception," endeavors to overcome this impression, setting forth clearly the principles and operation of receiving tubes, for detection and amplification. The book covers its subject in a non-technical manner, being designed for readers having little or no previous knowledge of either electricity or radio. It should be of considerable assistance to the layman who wishes to operate intelligently the bulbs of his radio telephone receiving set.

The ABC of Vacuum Tubes in Radio Reception, by E. H. Lewis. 132 pages, cloth. New York, 1922, Norman W. Henley Pub. Co. Price $1 from the publisher or of The Wireless Press, 326 Broadway, New York City.

Shows Commercial Apparatus

"How to make Commercial Type Radio Apparatus," by M. B. Sleeper, is primarily of interest to advanced amateurs and experimenters who desire specifications and detailed values to enable them to construct commercial type apparatus for their own use. The book covers, in detail, both transmitting and receiving sets of modern commercial types for practically every purpose. In addition, it has constructural details of many accessories, such as wave meters, condensers, precision measuring instruments, telephone receivers and B batteries.

How to Make Commercial Type Radio Apparatus, by M. B. Sleeper. New York, 1922, Norman W. Henley Pub. Co. 160 pages. Price 75 cents, in paper, from the publisher or of The Wireless Press, 326 Broadway, New York City.

Describes Crystal Sets

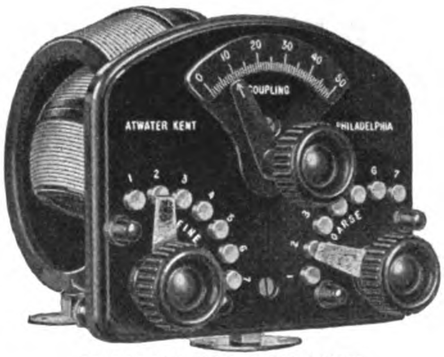
"Radio for the Amateur" is the descriptive title of a new book by A. H. Packer and R. R. Haugh; the name would have been even better if it had been "Radio for the Novice," for the volume of some 200-pages is exceedingly popular in type. It explains the fundamentals of wireless, condensing theory into several short and easily understandable chapters or "messages" as they are called. From theory the authors proceed to its practical use in apparatus, describing various crystal receivers and how to make them wtih instructions for operating. But two pages are devoted to bulb receiving sets, and these only describe the possibilities of the bulb in general terms. For that reason the book will have its sale practically confined to a radius of 25 miles around each broadcasting station. In those centers it should be of value to beginners.

Radio for the Amateur, by A. H. Packer and R. R. Haugh. Chicago, 1922, Goodheart-Willcox Co. 208 pages. Price $1.50 from the publishers or The Wireless Press, 326 Broadway, New York City.

Covers Radio Telephone

Careful yet popular explanations of the principles in use in radio telephoning and the instruments embodying them are to be found in the new book "Radio-Telephony for Everyone," by Laurence M. Cockaday. During the war, Cockaday was a radio instructor in the U. S. Navy, and his book reflects his experience in teaching wireless principles and operation. It is simple yet readable, and includes an outline of theory, and details of the simpler vacuum tube receiving sets. There is even a chapter on tube transmitters. This book makes an excellent study for those who have just started to listen to broadcast radio telephone programs.

Radio-Telephony for Everyone, by Laurence M. Cockaday. New York, 1922, Frederick A. Stokes Co. 212 pages, price $1.50 of the publisher or from The Wireless Press, 326 Broadway, New York City.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4946 Stenton Ave. *RADIO DEPT.* Philadelphia, Pa.

Some Measurements of Telephone Sensitivity

(*Continued from page 66*)

Frequency	$\frac{S\ (pulsating)}{S\ (sine)}$
498	0.63
660	.55
720	.75
840	.65
1020	.70
1200	.65

(2) Sound produced by alternating current of sine wave form in one telephone receiver being adopted as a standard, measurements were made of the current of the same wave form but in a second telephone receiver to produce equal sound. The telephone receivers compared were Western Electric Co. Type P-11 phones, to which the numbers L-2-B and L-2-A were assigned. Approximately sine-wave current was supplied to each at frequencies from 450 to 1200 cycles per second. The following table gives the values of the ratio of the current through receivers L-2-A to the current through receiver L-2-B to produce equal signals.

Frequency	$\frac{IL\text{-}2\text{-}A}{IL\text{-}2\text{-}B}$ *(sine wave)*
450	0.87
540	1.20
720	1.24
960	1.26
1080	0.90
1200	1.00

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Variable Condenser —built right

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The tension as well as adjusting is accomplished by tightening end thrust plug, causing a thrust between a hardened steel ball and a 45 degree tapered brass bushing, this insures smooth running and a contact equal to a soldered joint also a take-up for wear in years to come.

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23 " "	4.25	7 " "	3.25
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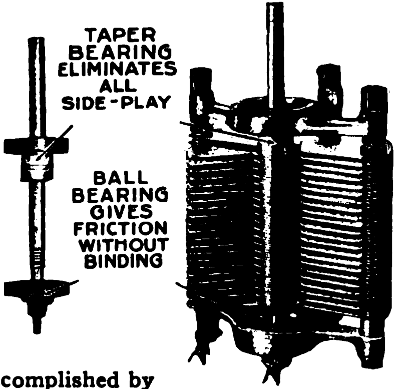
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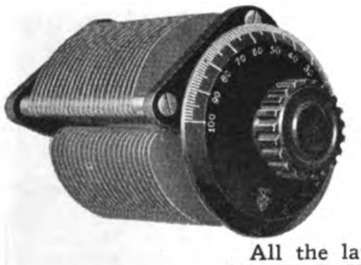

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INDIANAPOLIS, U. S. A.

A Book For Beginners

BEGINNERS who have just bought a receiving set, or who have decided to build one, will be interested in "Radio Receiving for Beginners," by R. T. Snodgrass and Victor F. Camp. The book, which has just come from the press, serves admirably as an opening volume in the new radio fan's radio library, and by provoking a desire for more detailed knowledge probably will stimulate the sale of more advanced works. There are some excellent instructions for tuning regenerative sets and operating amplifiers and this is perhaps the most valuable section to the beginner.

Radio Receiving for Beginners, by R. T. Snodgrass and Victor F. Camp. New York, 1922, The Macmillan Co., 100 pages, pocket size, 5x7 inches, bound in cloth. Obtainable through the Wireless Press, 326 Broadway, New York City.

What Radio Means to the Blind

(*Continued from page 45*)

A very similar situation is to be found in the Maine Institution for the Blind, Portland, whose superintendent, W. E. Travis, says:

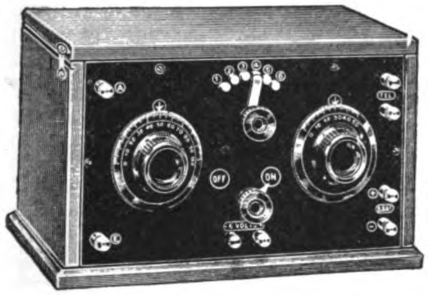
> We are contemplating the installation of a receiving set and are keenly interested in the project, feeling that it will increase the avenues of information from which the blind may learn what is going on about them.

In the meantime, while the blind are happily listening in increasing numbers daily, some of them who are talented in various ways, principally musically, have sung or played for the radiophone. One of the first such instances was last Fall, when during the New York Electrical Show, the radio station of the National Amateur Wireless Association broadcasted nightly concerts, two blind boys, violinist and pianist, performed. Since then many others have been "put on the air," in practically every station. KHJ, in Los Angeles, last May gave an entire evening's program with the aid of blind musicians.

Lack of the necessary funds hampers nearly every asylum, home, workshop and institution for the blind. They all want radio apparatus, for they know its unsurpassed advantages. Most of them work on a narrow budget, barely sufficient, even when increased by local philanthropists, to cover the operating expenses, and the expenditure of a few hundred dollars extra for a radio set with a loud speaker is beyond them. For from $275 to $300 it should be possible to provide apparatus suitable for the average home for the blind; maintenance of course is minor, consisting of keeping the battery charged and buying a new bulb occasionally.

The blind present an extraordinary field for the radio fan's charity.

THE WIRELESS AGE, will see that money or instruments given are divided among institutions in all parts of the country.



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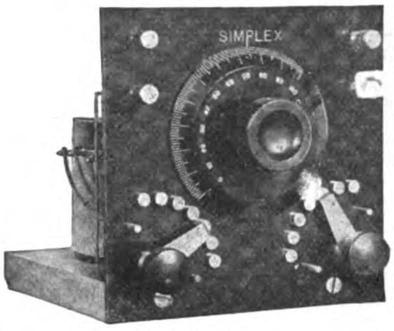

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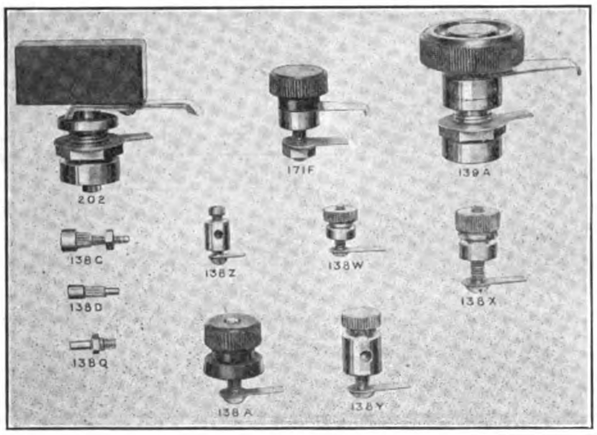

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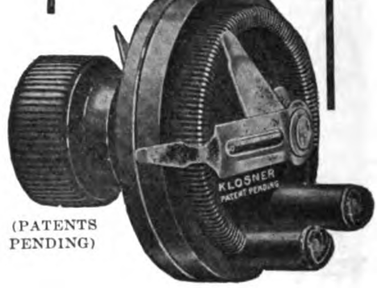

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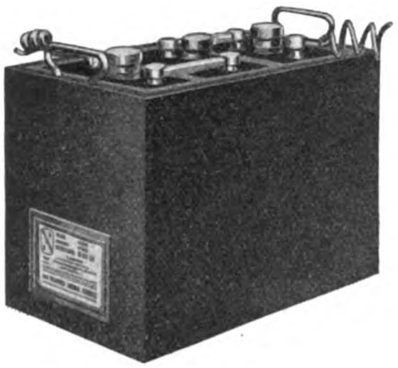

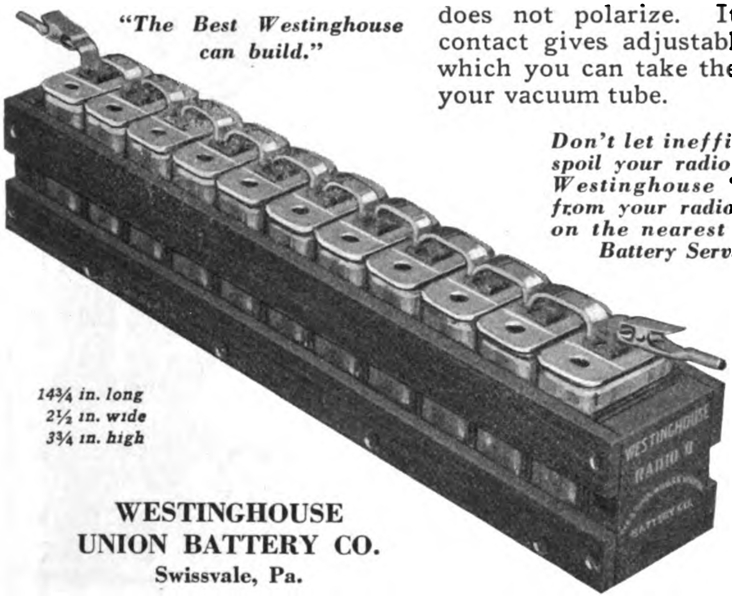

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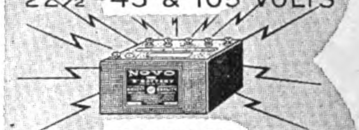

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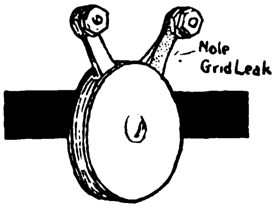

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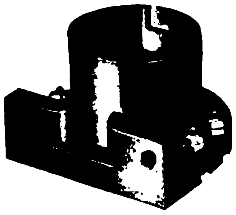

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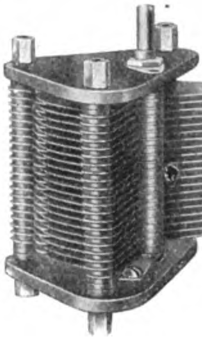

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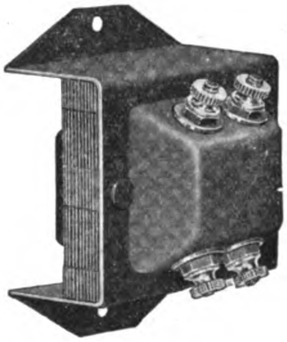

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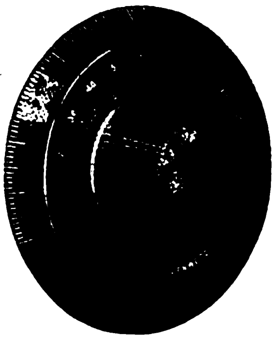

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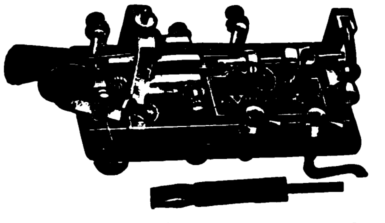

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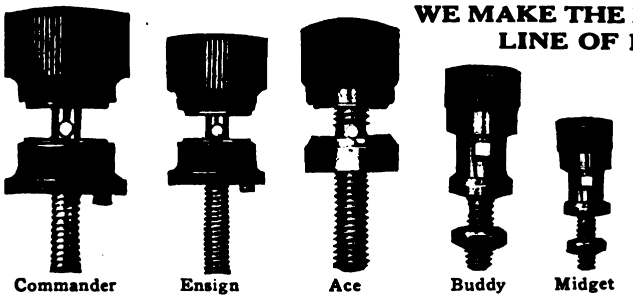

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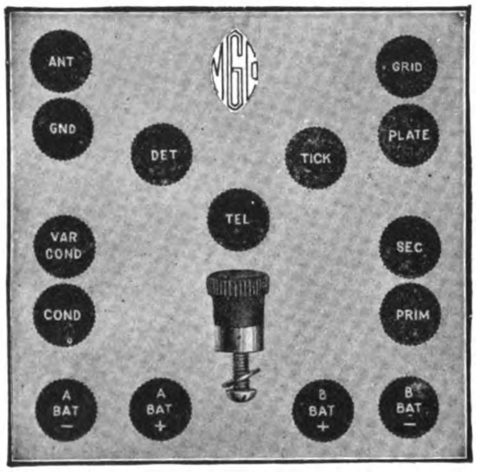

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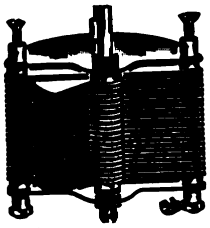

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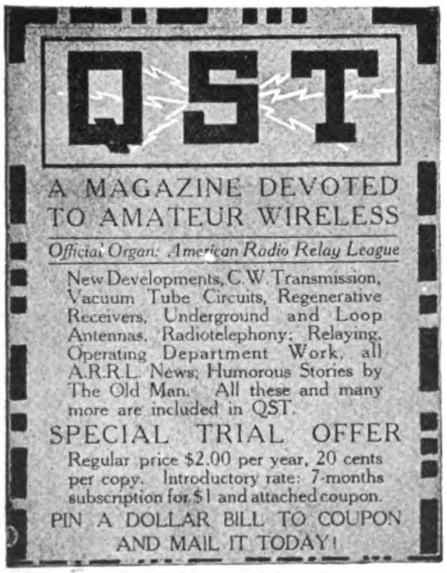

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Binding Posts: Hard rubber composition.
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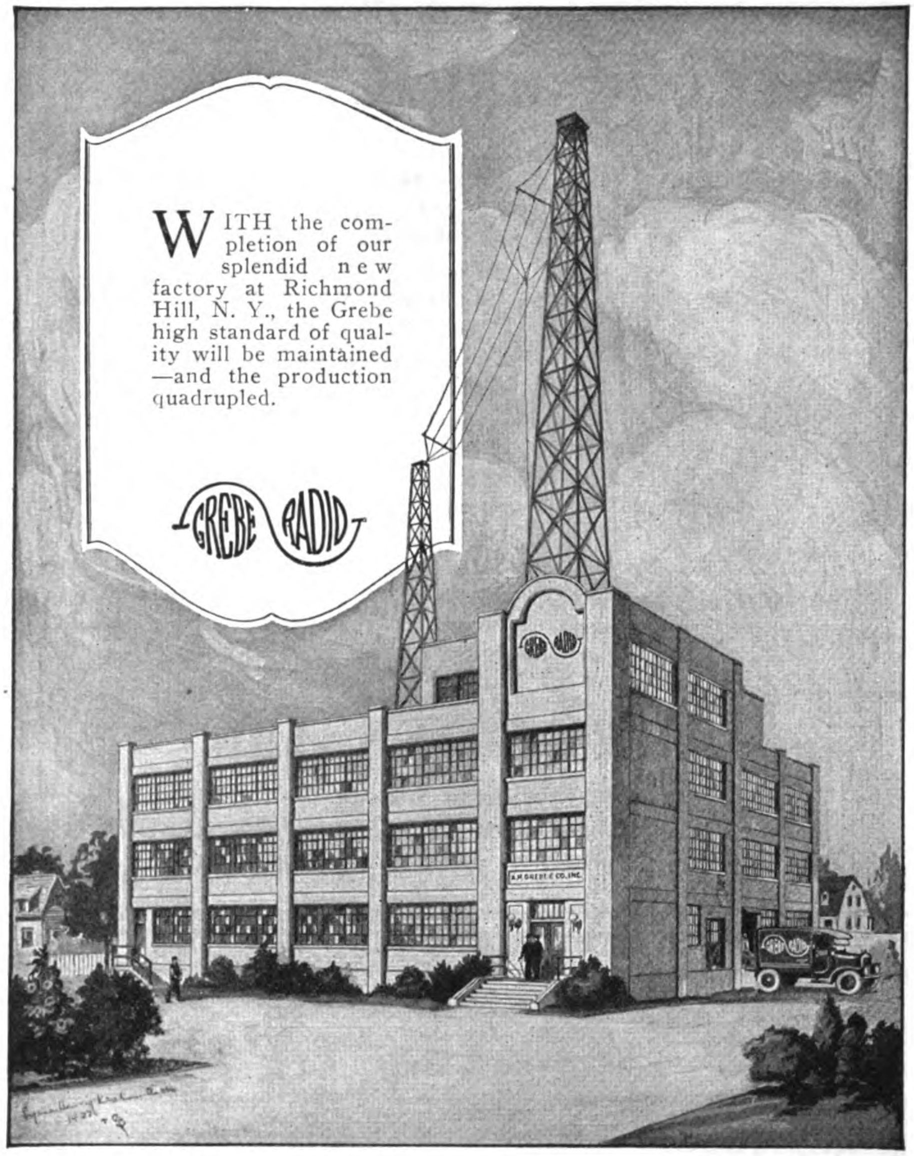

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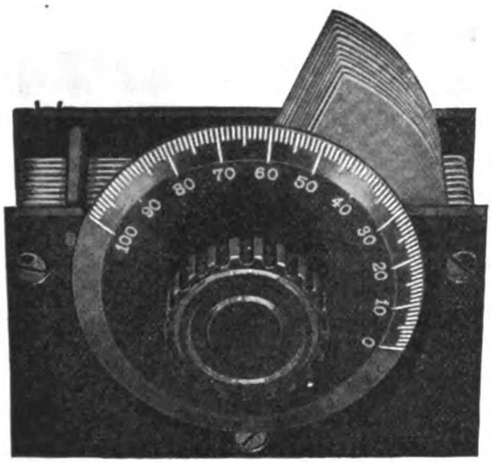

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Designed by R. S. Copp, formerly with the Engineering Division of the Air Service Radio Laboratories.

CONSTRUCTION

This condenser is of very sturdy construction, the plates being of hard aluminum; the movable plates are secured by an extra large shaft screw with large spacers, insuring against slippage of rotary plates. The stationary plates are secured by three screws thru high grade formica plates. There are no sliding contacts, the connection to the rotary plates is obtained by means of an extra flexible wire soldered to shaft, making an absolute contact at all times. This condenser is fitted with fibre stop to prevent going past zero setting.

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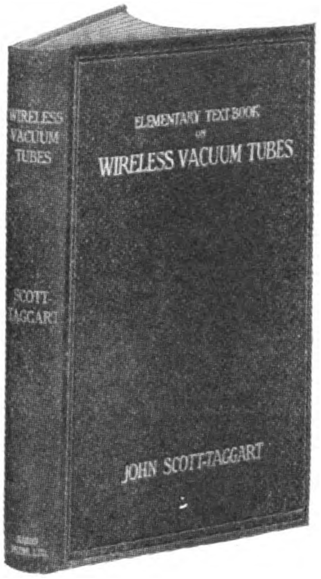

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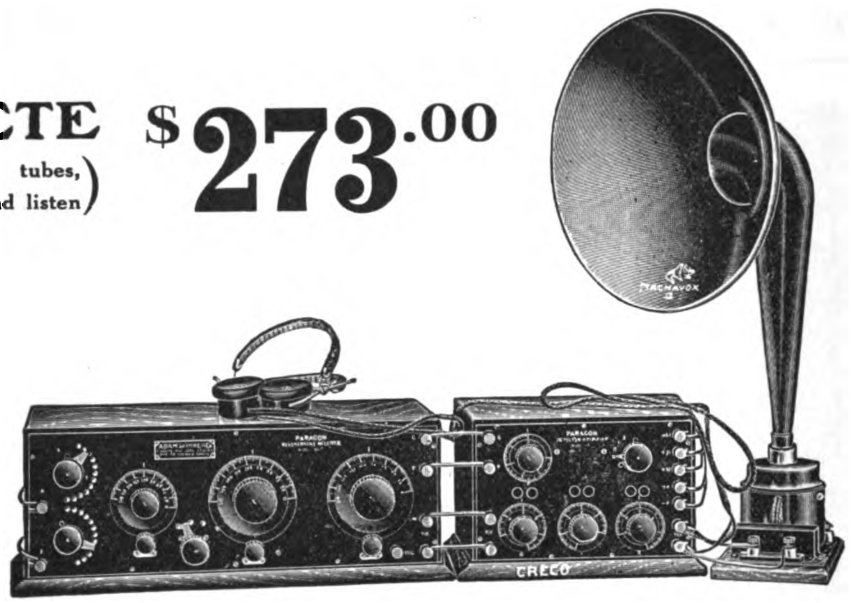

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4 MC Wheeless, Verne A., 103 Idlewild Park, Orlando, Fla.
4 MD Rainey, James W............ .. ....Statham, Ga.
4 ME Marchman, James W., 620 Highland Ave., Atlanta, Ga.
4 MF Donahue, Elmer A., 109 Bloodworth St., Raleigh N. C.
4 MG Thompson, Robt. S., 315 Neeley St., West Point, Ga.
4 MH Medford, Benj. S., 57 Gillman St.....Oxford, N. C.
4 MI Isenhoar, Paisley G., Fairview Cottage, Ashville,N. C.
4 MJ Calloway, Fuller E...................LaGrange, Ga
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4 MM Griswold, Loren W., 184 Waller St., Jacksonville, Fla.
4 MN Settle, Victor J., 492 Athens St..........Winder, Ga.
4 MO Allston, Wm. F., 14 Government St...Asheville, N. C.
4 MP Meador, W. A., U. S. Govt. Reservation, Oteen, N. C.
4 MQ Goodson, B. C., 1626 N. W. 7th Ave.....Miami, Fla.
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4 MS Collins, E. J., 922 N. 8th Ave........Pensacola, Fla.
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4 MU Freyer, Frederick R., 2425 Bull St....Savannah, Ga.
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4 MW Dunn, Wm. L., Jr., Hillside St......Asheville, N. C.
4 MX Weeks, P. L., Jr., 653 Sycamore St.....Decatur, Ga.
4 MY Dodd, Richard E., 4 East 13th St.......Atlanta, Ga.
4 MZ Liles, Marden, 1808 Oscola St...........Tampa, Fla.

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4 EK Kinney, DuPont G., 305 Cherokee Ave.....Macon, Ga.
4 EP Bacon, Geo. W., R. F. D. No. 4......Raleigh, N. C.
4 ER Nichols, Geo. H., 184 Cascade Ave., Atlanta, Ga.
4 GG Byrum, R. L., 131 Poplar St., Winston-Salem, N. C.
4 KF Tison, Wm. W., Jr., 1 Forsyth St.......Atlanta, Ga.

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5 AAR Lundy L. Ziegler, 2007 Huff St., Wichita, Falls, Tex.
5 AAS Samuel P. Dooley, 711 White St.....Norman, Okla.
5 AAT A. S. Webre, 743 Government St., Baton Rouge, La.
5 AAU H. C. Sundstrom, 1716 Lubbock St., Housotn, Tex.
5 AAV Chas. H. Thielman, R. F. D. No. 2, Powderly, Tex.
5 AAW J. M. Brooks, 508 E. Washington...McAlester, Okla.
5 AAX James Dominie.........................Krebs, Okla.
5 AAY Charles M. Dillion...................Covington, La.
5 AAZ Harle R. Peters, Box 185....Mountain Home, Ark.

5 ABA W C. Norris, 257 Maximillian St., Baton Rouge, La.
5 ABB Reginald C. Sweet, 807 Lahoma St..Norman, Okla.
5 ABC Military Gulfcoast Academy R. F. D. No. 2, Gulfport, Miss.
5 ABD G. J. Peuke, Jr., 4052 Baudin St., New Orleans, La.
5 ABE Edwin Helmke, 2111 Everett St.....Houston, Tex.
5 ABF William B. Glass, 101 Albany St., San Antonio, Tex.
5 ABG Clyde Phillips, 305 E. Hunt St...McKinney, Tex.
5 ABH E. H. Christy, 5347 Colisum St..New Orleans, Tex.
5 ABI H. E. Velte, R. F. D., No. 6, Box 14, Little Rock, Ark.
5 ABJ Francis C. Bowen, 1911 W. 12th St., Lubbock, Tex.
5 ABK J. G. J. Perkins, Jr., 1528 Vinton Ave., Memphis, Tenn.
5 ABL Norman B. Drake, 210 W. 8th St.....Tulsa, Okla.
5 ABM Claude E. Fox, 806 N. 5th Ave...Knoxville, Tenn.
5 ABN G. A. Reynolds, 522 So. Margin St., Franklin, Tenn.
5 ABD Wayman, Davenport, Texas St.........Plainview, Tex.
5 ABP Richard H. Gilley, 1205 Fawn St., Caldwell, Tex.
5 ABQ Cecil H. Stroup, Box 636.............Krebs, Okla.
5 ABR Wm. V. Harber, 484 Ave. A, N. W., Childress, Tex.
5 ABS R. E. Deckman, 1145 Russell Pl., San Antonio, Tex.
5 ABT G. T. Vickers, 104 Lewis St.....Montgomery, Ala.
5 ABU Oliver K. Doop.....................Pond Creek, Okla.
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5 ABZ Robert W. Carr, Jr., 3110 West Ave., Austin, Tex.

5 AGA Nickelauss, 235 S. 25th St................Paris, Tex.
5 AGB Gulf Radio Service, G. S. Rowe, Mgr., 763 Palmette St., Mobile, Ala.
5 ACC Elwyn K. Atkinson, Box 308........Childress, Tex.
5 ACD Tom Wheadon, 1829 Milan St.....New Orleans, La.
5 ACE John A. Wilkes, 909 N. 2nd St...Nashville, Tenn.
5 ACF Austin W. Pollard, 225 Marshall Ave., Houston, Tex.
5 ACG P. Y. Eyer, 108 First & Gilsen St., El Paso, Tex.
5 ACH Max Henry Jacobs, 404 James St...Houston, Tex.
5 ACI J. F. Walsh, 613 ... Florence St., El Paso, Tex.
5 ACJ Wade Hilliars, Ave. F & 14th St...Childress, Tex.
5 ACK Sydney G. Kent, 916 McGhee St...Knoxville, Tenn.
5 ACL Not issued.
5 ACM Arthur Hill, 118 E. 13th St.......Anniston, Ala.
5 ACN Sam Note..............................Bryan, Tex.
5 ACO Robert Frank, Kilmarnock St.........Mobile, Ala.
5 ACP R. L. Kuester, 401 Gargan St.......Houston, Tex.
5 ACQ Dale Hales, 3826 Anderson St.....Greenville, Tex.
5 ACR F. W. Scharpwinkel, 2402 Ave. I, Galveston, Tex.
5 ACS Walter D. McCormick, 2222 Burdette St., New Orleans, La.
5 ACT W. D. Bowen, Jr., 633 W. Hopkins St., San Marcos, Tex.
5 ACU Geo. T. Perry, 233 Claudia St...San Antonio, Tex.
5 ACV A. M. Reager, 1817 Huntsville Ave., Birmingham, Ala.
5 ACW John Fink Jewelry Co., J. D. Fink, 809 N. Sixth St., Fort Smith, Ark.
5 ACX Wm. H. Pierce, 1227 S. Hull St...Montgomery, Ala.

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5 ADH D. R. Simmons, 336 Baronne St...New Orleans, La.
5 ADI San Benito Radio Club (B. G. Eubank, Sec.), San Benito, Tex.
5 ADJ Raymond Holt...................Charleston, Ark.
5 ADK Malcolm Purnell, 2731 Ursuline Ave., New Orleans, La.
5 ADL G. M. McCarrell, Jr., 601 Asia St., Baton Rouge, La.
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5 ADP Roby Lee Cathey, Box 152............Lubbock, Tex.
5 ADQ W. E. Tomlin, 5212 Classen Blvd., Okla. City, Okla.
5 ADR L. Bradberry, 1122 Welch St......Little Rock, Ark.
5 ADS W. E. Hood, Arlington, Pl., W. E. Birmingham, Ala.
5 ADT J. T. Lassetter, Wedowie St.......Roanoke, Ala.
5 ADU Jeff Davis Griffin, 220 Apache St., Norman, Okla.
5 ADV Jack Reavley..............................Alba, Tex.
5 ADW E. S. Van Sickle, 2304 Ringe St...Little Rock, Ark.

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5 DU W. E. Gray, Jr., 1112 W. 3rd St., Little Rock, Ark.
5 DV Briscoe N. Jones, 924 E. Main St., Okmulgee, Okla.
5 EF M. C. Poor, 437 W. Grand Ave., McAlester, Okla.
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5 AT John Oldaker, 416 S. High St., Albuquerque, N. M.
5 BR B. R. Jones, 28th & Arline St., Muskegee Okla.
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5 DP J. H. Uhalt, 1219 N. Rampart St., New Orleans, La.
5 ET L. Davis, 406 Hathaway Ave.......Houston, Tex.
5 FA Ralph E. Smith................College Station, Tex.
5 FE Roy Lee Miller, W. 13th Ave.......Corsicana, Tex.
5 FK John Brydson, Box 314................Austin, Tex.
5 FN W. Peacock, 1401 Boulevard..........Houston, Tex.
5 FV K. H. DeWitt, Jr., 1612 15th St., Ave. S, Nashville, Tenn.
5 FX A. A. Murdoch, Jr., 328 Upsen Ave., El Paso, Tex.
5 FY New Mexico College Agri. & Mech. Arts, State College, N. M.
5 FZ New Mexico College Agri. & Mech. Arts, State College, N. M.
5 GR Leslie E. Richards, Box 368..........Beeville, Tex.

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5 JB Roy Dishereen, 112 W. Mineral St., Hot Spring, Ark.
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5 RS F. R. Matejka, 1201 Alligator St., Calwell, Tex.
5 GK C. Andres, Jr., 2525 Myrtle St., New Orleans, La.
5 JD W. Kinselving, 1605 Cedar St., Little Rock, Ark.
5 MJ Robert Glass, 2605 Clarence St........Dallas, Tex.
5 OB Lee Andrew Lewis, 1013, Neiner St., Houston, Tex.
5 SG Ray. U. McKinney, 1342 N. Elwood St., Tulsa, Okla.

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5 BW T. Bernerio, 277 Wisconsin St.....Memphis, Tenn.
5 CB Charles R. Galloway, 1516 Arch St., Little Rock, Ark.
5 DO Walker L. Wellford, Jr., 205 Belvedere St., Memphis, Tenn.
5 DS Dannah Boyette, 111 North 7th St....Lawton, Okla.
5 HK Le Roy Moffett, 223 E. 4th St., Oklahoma City, Okla.
5 HL William D. Van Dyke, 542 McCallie St., Chattanooga, Tenn.
5 LU Wm. B. Taylor, Box 28....Signal Mountain, Tenn.
5 NZ Alfred L. Cowels, 1101 Vance St.....Memphis, Tenn.
5 CH Wm. J. Uhalt, 1101 Pershing St...New Orleans, La.
5 FO R. E. Kelley.........................Haskell, Okla.
5 NV M. M. Brooks, 316 N. Rio Grande St., El Paso, Tex.
5 FH E. L. Deutschman, 912 National Ave., E. Las Vegas, N. M.
5 GQ E. C. Barthelomew, 902 West Av.......Austin, Tex.

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9 CEV Milo M. Littleton, South Wing, Capitol Bldg., Madison, Wisc.
9 CEW G. A. Schlinkert, 1519 N. Crawford Ave., Chicago, Ill.
9 CEX Illinois Fixture & Electrical Supply Co., 56 Lake St., Chicago, Ill.
9 CEY Richard C. Bird..................Parker, S. Dak.
9 CEZ Elef W. Burglef, 7307 Geenwood Ave....Chicago, Ill.
9 CFA Elroy H. Black, 11515 Wallace St.....Chicago, Ill.
9 CFB Hilton C. Ingle ....Thoyer, Mo.
9 CFC Samuel S. Stoller, 2445 Chicago, Ave...Chicago, Ill.
9 CFD Oral D. Florence.................Thompson, Iowa.
9 CFE William B. Cottrell................Prairie City, Iowa
9 CFF R. W. Blucke, 221 Caldwell St...Jacksonville, Ill.
9 CFG Cletus Driskel, 441 Sherman Ave....Wichita, Kans.
9 CFH Wm. R. Welton, 209 N. 11th St........Mattoon, Ill.
9 CFI Vertice D. Wilson, 128 N. Cedar St...Ottawa, Kans.
9 CFJ Harry O. Berg.......................St. James, Minn.
9 CFK Clarence L. Arundale, 1203 S. Main St..Lewistown Ill.
9 CFL J. C. McGregor, 304 E. Washington St., Pontiac, Ill.
9 CFM F. Adam Electric Co., 902-4 Pine St., St. Louis, Mo.
9 CFN Leonard B. Wilke, 376½ First Ave..Milwaukee, Wisc.
9 CFO Donald Anderson 1320 W. 44th St...Des Moines, Iowa
9 CFP Malcolm W. McRae, 634 Grace St........Chicago, Ill.
9 CFQ Joseph J. Cerry, 5612 W. 24th St.........Cicero, Ill.
9 CFR Howard Frank................................Plano, Ill.
9 CFS Fred S. Palm, 5815 Roosevelt Rd., W.....Cicero, Ill.
9 CFT John F. Schneider, Summer St.....Schofield, Wisc.
9 CFU Joe Schindler, 2318 E. St.......Granite City, Ill.
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9 CFW Patrick J. Dougherty.............Collegeville, Minn.
9 CFX Ralph L. Nolan, 426 N. Byers Ave.......Joplin, Mo.
9 CFY Clarence O. Ford, 523 S. Hancock St., Colorado Springs, Colo.
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9 CGA Merle F. Buck, 677 Lawn Ridge..Huron, S. Dak.
9 CGB R. J. LeDuc, 729 Montana Ave...S. Milwaukee Wisc.
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9 CGH Leroy Monosmeth, 1017 Van Wie St., Rockford, Ill.
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9 CGK James W. Korman, 3518 Itaska St...St. Louis, Mo.
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9 CGM Wm. E. Britton, 211 N. Jackson St., West Frankfort, Ill.
9 OGN J. A. Steinlage, 2550 N. Grand Ave., St. Louis, Mo.
9 CGO Gilbert S. Jackson, Box 5............Galatia, Ill.
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9 CGQ E. W. Kersten, 700 Baker Ave., Menominee Mich.
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9 CGT G. T. Eastland, 2110 Clark St..........Chicago, Ill.
9 CGU Walter H. Bornholdt, 412 Windom St...Peoria, Ill.
9 CGV Ralph O. Ankeny, 294 W. Bluff St., Marseilles, Ill.
9 CGW Lorin K. Hill.........................Fairfield, Nebr.
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9 CGY C. M. Moulder, 1712 W. 14th St...Davenport, Iowa
9 CGZ Sanford Griffen, 2700 E. 13th St.....Denver, Colo.

9 GHA Arthur G. Coulson............Beaver Crossing, Nebr.
9 CHB R. H. Weyant, 615 E. Morgan St.......Dixon, Ill.
9 CHC Clarke H. Johnson, 820 N. Main St...Spencer, Iowa
9 CHD Donald R. Laird, Lincoln St., Box 71, Malvern, Iowa
9 CHE W. O. Forrest, R. F. D. Arlington Township Poynette, Wisc.
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9 CHG Fred. C. Krick.................North Liberty, Ind.
9 CHH E. E. Zimmerman, 121 McKay St..Frontenac, Kans.
9 CHI Gordon Armstrong...........................Britt, Iowa
9 CHJ Herbert Schnur, Jr., Eastmoreland Pl.....Joplin, Mo.
9 CHK P. T. Stephens, 112 S. Hickory St., Platteville, Wis.
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9 CHM F. B. Smiley, 514 S. Jackson St......Belleville, Ill.
9 CHN Oscar A. Rosel....................St. Ansgar, Iowa
9 CHO John A. Davies, 517 Ottumwa St.....Ottumwa, Iowa
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9 CHW Everett M. Strous, 243 Crosat St.....LaSalle, Ill.
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9 CHY Richard DuPuy, 1663 St. Claire St. St. Paul, Minn.
9 CHZ H. E. Giltner, 3 Strand Apts.........Ft. Dodge Iowa

9 CIA Winfield R. Smith, 2239 Bellefontaine St., Indianapolis, Ind.
9 CIB Roy M. Hukle, Route No. 4, Box 23..Lexington, Ky.
9 CIC Clifton M. Fisbach, 124 Poplar St.....Seymour, Ind.
9 CID Kirk T. Pruess, R. R. No. 11, Park Ave. and Lynn St., Springfield, Mo.
9 CIE M. F. Kettmeier, 2214 D St.....Granite City Ill.
9 CIF Archie O. Peterson, 706 N. 3rd St...Ft. Dodge, Iowa
9 CIG Irvine G. Sennett, 2804 W. 3d St...Duluth, Minn.
9 CIH Frederick M. Edwards...............Maitland, Mo.
9 CII C. F. Quentin, 824 Minnesota Ave., S. Milwaukee, Wis.
9 CIJ Dan Lake..............................Lake City, Kans.
9 CIK Ivar Nelson, 1010 Michigan Ave., Menominee, Mich.
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9 CIM Frank H. McIntosh, 4160 Chicago St...Omaha, Nebr.
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9 CIP Frederick and Davis Weyerhaeuser, 480 Grand Ave., St. Paul, Minn.
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9 CIR Central Radio Club, 1922 Orchard St...Chicago, Ill.
9 CIS Murtin D. Hoover, 216 W. Third St., Bicknell, Ind.
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9 CJA Maurice B. Wells, 2145 Hazel Ave...Indianapolis, Ind.
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9 CJC J. C. Mosby, Jr., 425 Fairlawn Ave., Webster Groves, Mo.
9 CJD Dewar B. Victor, 1102 Park Ave.....Omaha, Nebr.
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9 CE Thomas H. Lokken, 162 Bluff St...Ishpeming, Mich.
9 CL Kesselman O'Driscoll Co., 517-19 Grand Ave., Milwaukee, Wisc.
9 CV Frank E. Nellis, Edgewater Beach Hotel, Chicago, Ill.

9 DI Herbert J. Ellis, 526 E. 63d St.........Chicago, Ill.
9 DU George S. Turner, 124 Pearl St. S.Independence, Mo.
9 LS L. R. Schmitt, 1522 Bellepiaine Ave.....Chicago, Ill.
9 QT J. Earl Goodwin, 429 Garfield Ave., Indianapolis Ind.
9 RQ Radio Equipment & Mfg. Co., 113 E. Second St., Davenport, Iowa
9 RX C. O. Stimpson, 416 Dearborn St........Chicago, Ill.
9 BJF Northern Illinois Telephone Co., 213 Washintgon St., Mendota, Ill.
9 CBN Frederick H. Beach, 10 W. Sycamore St., Vincennes, Ind.
9 DIN Camp Roosevelt.................Rolling Prairie, Ind.
9 DVO Bertram A. Gooch, 1903 W. 23d St..Des Moines, Iowa

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9 ADA Kester Marhols, 3051 Wilson Ave.......Chicago, Ill.
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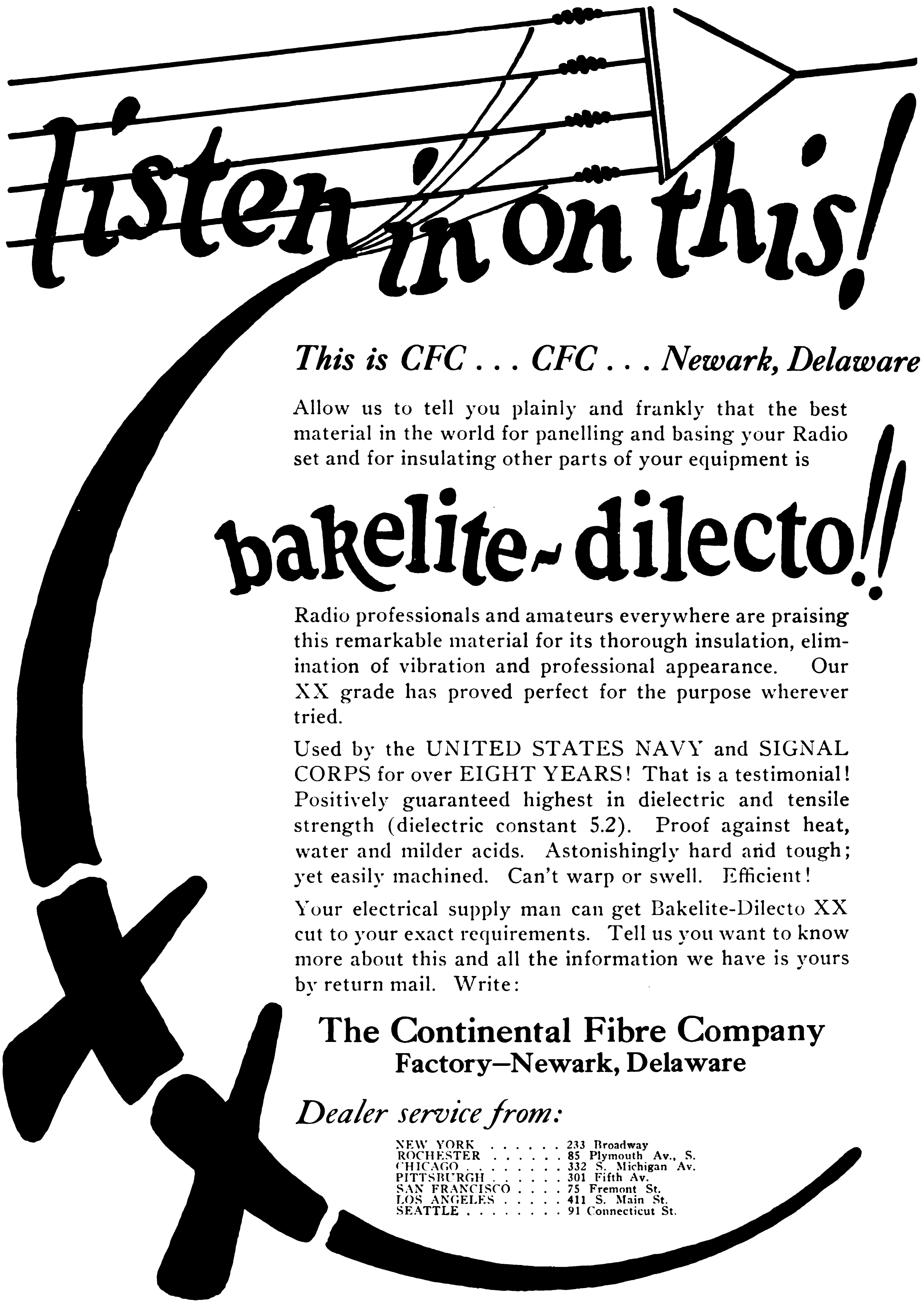
9 BHF Verdon Stones, 571 Harper St...Webster Groves, Mo.
9 BJM W. H. Taussig, 549 E. Argonne Drive, Kirkwood, Mo.
9 BNA H. H. Dozois, 138 S. Harvey St., Oak Park, Ill.
9 CBQ Malcolm W. McRae, 105 S. Babcock St...Urbana, Ill.
9 CFP Malcolm W. McRae, 634 Grace St.....Chicago, Ill.
9 DKB L. H. Weeks, 1116 5th St., S. E. Minneapolis, Minn.
9 DTP John W. Ritchey, 351 Broadway......Augusta, Kans.
9 DVM John Henry Grady, Westgate Hotel Kingshighway & Delmar, St. Louis, Mo.
9 EN Clifton M. Utley, 6027 Woodlawn Ave., Chicago, Ill.
9 FZ Randall C. Ballard, 203 E. White St., Champaign, Ill.
9 QO Guy May, 1103 Massachusetts St....Lawrence, Kans.
9 LS Verne A. H. Swenson, 1317 Jenifer St., Madison, Wisc.
9 AAX Bloomington-Normal Council, Boy Scouts of America, Bloomington, Ill.

LIMITED COMMERICIAL STATIONS

KDZQ William D. Pyle, 429 S. Sherman St...Denver Colo.
KDZU Western Radio Corporation, 737 Lincoln St., Denver, Colo.
KOA Young Men's Christian Association, (W. H. Smith), Lincoln and 16th Aves, Denver, Colo.
WAAF Chicago Daily Drovers Journal, 844 Exchange Ave., Chicago, Ill.
WEAK Julius B. Abercrombie, 819 N. 23d St..St. Joseph, Mo.
WEAU Davidson Brothers Company, 4th and Pierce Sts., Sioux City, Iowa
WEAV Sheridan Electric Service Co. (T. C. Shipley), Rushville, Nebr.
WEAZ Donald Redmond, 1120 Bertch Ave.....Waterloo, Iowa
WFAC Superior Radio Company, 2326 John Ave., Superior, Wisc.
WFAD The Watson Weldon Motor Supply Co., 123 S. 7th St., Salina, Kans.
WFAK Domestic Electric Company, 7908 Eulalie St. Brentwood, Mo.
WFAM Times Publishing Company, 18 N. Sixth Ave., St. Cloud, Minn.
WFAN Hutchinson Electric Service Co., 115 Main St., Hutchinson, Minn.
WFAP Brown's Business College, Jefferson and Liberty Sts., Peoria, Ill.
WFAQ Missouri Wesleyan College and the Cameron Radio Company, Cameron, Mo.
WFAS United Radio Corporation, 1106 E. Columbia St., Ft. Wayne, Ind.
WFAT The Daily Argus Leader, 109-111 N. Main Ave., Sioux Falls, S. Dak.
WFAV University of Nebraska..............Lincoln, Nebr.
WFAY Daniels Radio Supply Co., 209 N. Sixth St., Independence, Kans.
WGAJ Gass, W. H., 413 7th Ave.........Shenandoah, Iowa
WGAS Ray-Di Company Organization, Inc., 1215 Leland Ave., Chicago, Ill.
WGAT American Legion, Department of Nebraska, Lincoln, Nebr.
WGAY Northwestern Radio Co., Inc., 250 State St., Madison, Wisc.
WGAZ South Bend Tribune, Colfax and Lafayette Sts., South Bend, Ind.
WHAA State University of Iowa............Iowa City, Iowa
WJC Indian Pipe Line Corporation........Owensboro, Ky.
WRM University of Illinois.......................Urbana, Ill.



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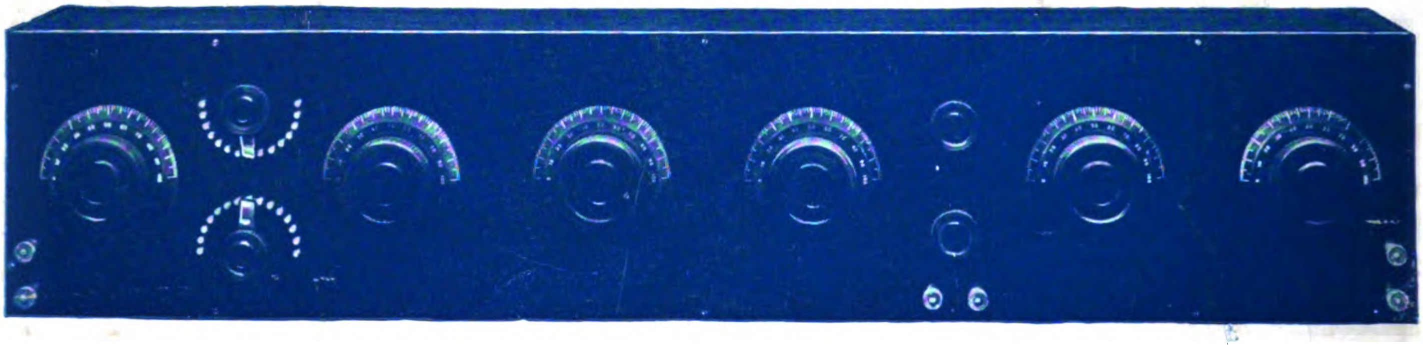

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